Five-Year Review Report

Third Five-Year Review
for
Tri-City Industrial Disposal Site

Bullitt County, Kentucky

April 2008

Prepared By:
E^2 Inc.
Charlottesville, Virginia
2417 Northfield Road
Charlottesville, VA
22902

For:
United States Environmental Protection Agency
Region 4
Atlanta, Georgia

Approved by:

for
Franklin E. Hill
Director, Superfund Division

Date:
4/29/08

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Third Five-Year Review Report
for
Tri-City Disposal Company
Rte. 1526 at the Gravel Road
Shepherdsville
Bullitt County, Kentucky

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List of Acronyms

AEGL	American Environmental Group Ltd.
ARAR	Applicable or Relevant and Appropriate Requirement
ATSDR	Agency for Toxic Substances and Disease Registry
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CIC	Community Involvement Coordinator
COC	Contaminant of Concern
DAF	Dilution Attenuation Factor
DCE	Cis-1,2-dichloroethene
EPA	United States Environmental Protection Agency
ERA	Emergency Removal Action
ESD	Explanation of Significant Differences
FYR	Five-Year Review
GAC	Granular Activated Charcoal
IC	Institutional Control
KDEP	Kentucky Department of Environmental Protection
KNREPC	Kentucky Natural Resources and Environmental Protection Cabinet
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MW	Monitoring Well
NCP	National Contingency Plan
NPDES	National Pollution Discharge Elimination System
NPL	National Priorities List
OU	Operable Unit
O&M	Operation and Maintenance
PCE	Tetrachloroethene
PPB	Parts per billion
PCB	Polychlorinated Biphenyl
PRG	Preliminary Remediation Goal
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RBC	Risk-Based Concentration
RD/RA	Remedial Design/Remedial Action
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SOW	Statement of Work
SSL	Soil Screening Level
SVOC	Semi-volatile Organic Compound
TBCs	To be considered goals/criteria
TCE	Trichloroethene
THMs	Trihalomethanes
UAO	Unilateral Administrative Order
µg/kg	micrograms per kilogram
µg/l	micrograms per liter

VOC	Volatile Organic Compound

Executive Summary

Introduction

The Tri-City Disposal Superfund Site is located in the community of Brooks in north-central Bullitt County, Kentucky, approximately 15 miles south of Louisville and four miles west of U.S. Interstate 65. The Site comprises approximately 349 acres and is located on the south side of State Highway 1526 (also known as Brooks Hill Road). The Site is located in an area of rural residential and agricultural land uses. Contamination at the Site was caused by an industrial waste landfill at which drummed liquid wastes were disposed of. An Emergency Removal Action (ERA) was conducted in 1988 to address soil contamination.

Two operable units (OUs) were defined for the Site. OU1 was defined to address contamination known at the time of the 1991 Record of Decision (ROD) in sediment, surface water, ground water, and soils. OU2 was defined to address any contamination found during the confirmatory sampling of soils, sediment, and ambient air, and their cleanup, if needed.

The 1991 ROD's selected remedy for OU1 of the Tri-City Disposal Site included five major components. These were:

- Institutional Controls (ICs) to restrict the use of ground water containing, or potentially containing, levels of contamination in excess of maximum contaminant levels (MCLs) or maximum contaminant level goals (MCLGs);
- Continued provision of potable water to residents who previously used contaminated ground water as a source of potable water until EPA, through monitoring, determines that the water is of sufficient and consistent quality for human consumption;
- Long-term monitoring of the ground water, surface water, sediment, and ecology. Long term monitoring of ground water, onsite springs, surface water, and sediment will continue for up to 30 years;
- Confirmatory sampling to assess efficacy of the removal action and the extent of contamination in other media; and
- Treatment of the Cox spring water with carbon adsorption until the springs achieve MCLs, which was initially expected to take 10 years.

Remedial Action construction began in June 1993, and the Site achieved construction completion in March 1996. The ICs required for OU1 are the only portion of the remedy that has not yet been formally put in place. There are several parcels at the Site that will need additional ICs due to resource use in the area; some will need only ground water use restrictions, while others will need both ground water and soil restrictions due to the presence of residual subsurface soil contamination at the Site. ICs for the Site are currently being designed. A ROD Amendment or Explanation of Significant Differences (ESD) will be needed to select the additional IC requirements. The long-term monitoring has been proceeding as planned and is ongoing. The confirmatory sampling was completed in 1993 and led to a No Action ROD for OU2. Treatment of the Cox Spring and Unnamed Spring No. 1 is ongoing and is effective at removing volatile organic compounds (VOCs) from the spring water. However, because contaminant concentrations in the impacted springs have not decreased significantly in the last five years and still exceed the MCL or non-zero MCL Goals, operation and maintenance (O&M) of the remediation system will continue until the Site's performance standards are met or until the concentrations of VOCs in the spring water are no longer considered a threat to human health or the environment.

The first Five-Year Review (FYR) was issued in April 1998; this review found the remedy to be protective. The second FYR, performed in 2003, found that the remedy continued to operate as required by the ROD. The triggering action for the present FYR is the signature date of the last FYR on April 29, 2003. The next review is scheduled for 2013.

Technical Assessment

According to data reviewed and the site inspection, the remedy is functioning largely as intended by the ROD, with the exception of ICs and the persistent contamination in the spring water. The Potentially Responsible Parties (PRPs) have begun working with attorneys to draft ICs that will formally restrict the use of spring water at the Site, as required by the ROD for OU1. Though not specified in the ROD, plans are also underway for ICs to restrict use of certain parcels of land at the Site. If implemented, this would call for an OU1 ROD Amendment or an Explanation of Significant Differences. Land use at the Site remains rural residential and agricultural, and there is interest in construction of additional structures, including at least one residence. Because sampling results from the Kentucky Department of Environmental Protection (KDEP) indicate that contamination exceeding current state and Region 4 cleanup goals remains in subsurface soils, this new construction will require precautions and will likely be affected by the implementation of land use ICs at the Site.

The PRPs conducted a new Focused Risk Assessment recently, which uses different exposure assumptions from the original Risk Assessment for the Site, since spring water is no longer used as a source of drinking water. There have also been some changes to applicable standards since the selection of the remedy, including a change in the MCL for chloroform. As VOCs in the Cox Spring and Unnamed Spring No. 1 do not show signs of decreasing as quickly as anticipated, either continued monitoring and treatment will be necessary or the new risk assessment will be used to demonstrate that VOC concentrations in the spring water do not present a threat to human health or the environment. In addition, an assessment should be conducted to evaluate the possibility that contaminated soils are leaching VOCs to ground water and a screening level vapor intrusion assessment should be conducted to determine whether this potential pathway presents an unacceptable risk to human health. As also mentioned in the previous FYR, KDEP remains concerned about residual soil contamination at the Site, which may warrant a further review by EPA. There is no other information that calls into question the protectiveness of the remedy.

Conclusion

The assessment carried out for this FYR found that the remedy has been implemented in accordance with the requirements set forth in the Site's 1991 ROD and is functioning as expected with the exception of ICs and the persistent contamination in the spring water. The remedy is protective of human health and the environment in the short term because of the treatment and monitoring of ground water at the Cox Spring and Unnamed Spring No. 1, access restrictions on the Klapper Spring, provision of families with access to the public water supply, and continued monitoring of VOC contamination at the Site. The surface soils do not appear to be a source of concern, the springs are not being used for drinking water, and the site owners and neighbors are informed about the Site.

However, sampling indicates that VOCs persist in the two active monitoring wells and three affected springs. In order for the remedy to be protective in the long term, the contaminated spring water will need to be monitored and treated until it achieves ground water cleanup goals established in the ROD or until the PRP's new Focused Risk Assessment can be used to support that the spring water does not present a threat to human health or the environment. In addition, ICs to restrict use of ground water will need to be implemented and a screening level vapor intrusion assessment will need to be conducted to determine whether this potential pathway presents an unacceptable risk to human health. Soil sampling indicates the presence of residual contamination in subsurface soils. In order to ensure long term protectiveness, the residual subsurface soil contamination should be evaluated to determine if the soils are leaching VOCs to the ground water and appropriate action should be taken. If ICs are pursued to require land use restrictions on excavation and construction at the Site because there is contamination that does not allow for unlimited use or unrestricted exposure, specific soil concentration levels should be developed to indicate the threshold levels that would require IC restrictions on excavation and construction at the Site. EPA should follow appropriate guidelines for selecting and implementing ICs for soils since there are currently none required in the ROD.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name ***(from WasteLAN)*****: Tri-City Disposal Co.**		
EPA ID ***(from WasteLAN)*****: KYD981028350**		
Region: 4	**State: KY**	**City/County: Brooks/Bullitt County**
SITE STATUS		
NPL status: ☒ Final ☐ Deleted ☐ Other (specify)		
Remediation status (choose all that apply): ☐ Under Construction ☒ Operating ☐ Complete		
Multiple OUs?* ☐ YES ☒ NO	**Construction completion date:** 03/1996	
Has site been put into reuse? ☒ YES ☐ NO Continued residential and agricultural use.		
REVIEW STATUS		
Lead agency: ☒ EPA ☐ State ☐ Tribe ☐ Other Federal Agency		
Author name: Amanda Knoff		
Author title: Project Manager	**Author affiliation: E^2 Inc.**	
Review period**: October 17, 2007 to April 29, 2008		
Date(s) of site inspection: November 14, 2007		
Type of review: ☒ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only ☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead ☐ Regional Discretion		
Review number: ☐ 1 (first) ☐ 2 (second) ☒ 3 (third) ☐ Other (specify)		
Triggering action: ☐ Actual RA Onsite Construction at OU# ☐ Actual RA Start at OU# 1 ☐ Construction Completion ☒ Previous Five-Year Review Report ☐ Other (specify)		
Triggering action date ***(from WasteLAN)*****: 4/29/03**		
Due date ***(five years after triggering action date)*****: 4/29/08**		

* [“OU” refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form continued

Issues:
1) No formal ICs are currently in place to restrict the use of spring water or ground water at the Site.
2) Some subsurface soil contamination has been identified and there is planned construction of a residence adjacent to the cap and actual construction of a barn on the capped portion of the Site.
3) Monitoring data indicate that the contaminant concentrations in ground water are not decreasing as rapidly as predicted in the ROD. This suggests the potential for a continuing source of VOC contamination from the Site's soils to the ground water.
4) A screening level vapor intrusion assessment has not been conducted to determine whether this potential pathway presents an unacceptable risk to human health.

None of the issues affect current protectiveness. Issues 1, 2, 3, and 4 may affect future protectiveness.

Recommendations and Follow-up Actions:
1) Design and formally implement ICs to restrict the use of spring water and ground water as soon as possible.
2) Implement land use ICs and educate residents on their rights, responsibilities, and the risks associated with subsurface soil contamination left in place. If ICs are pursued to require land use restrictions on excavation and construction at the Site, specific soil concentrations should be developed that indicate the threshold concentrations for residual soils that would require IC restrictions. EPA should follow appropriate guidelines for selecting and implementing soil ICs, as there are currently none required in the ROD.
3) Consider conducting additional soil sampling to evaluate whether there is a continuing source of contamination in the Site's soils. Continue to conduct required O&M and long-term monitoring or accept the new PRP Focused Risk Assessment.
4) Conduct a screening level vapor intrusion assessment, evaluate results, and if results indicate an unacceptable risk, assess and perform remediation to address this risk.

Protectiveness Statement(s):
The remedy at the Tri-City Disposal Site currently protects human health and the environment. Exposure pathways that could result in unacceptable risks are being controlled. The assessment carried out for this FYR found that the remedy has been implemented in accordance with the requirements set forth in the Site's 1991 ROD, with the exception of ICs. The remedy is protective of human health and the environment in the short term because of the treatment and monitoring of ground water at the Cox Spring and Unnamed Spring No. 1, access restrictions on the Klapper Spring, provision of families with access to the public water supply, and continued monitoring of VOC contamination at the Site. The surface soils do not appear to be a source of concern, the springs are not being used for drinking water, and the site owners and neighbors are informed about the Site.

However, sampling indicates that VOCs persist in the two active monitoring wells and three affected springs. In order for the remedy to be protective in the long term, the contaminated spring water will need to be monitored and treated until it achieves ground water cleanup goals established in the ROD or until the PRP's new Focused Risk Assessment can be used to support that the spring water does not present a threat to human health or the environment. In addition, ICs to restrict use of ground water will need to be implemented and a screening level vapor intrusion assessment will need to be conducted to determine whether this potential pathway presents an unacceptable risk to human health. Soil sampling indicates the presence of residual contamination in subsurface soils. In order to ensure long term protectiveness, the residual subsurface soil contamination should be evaluated to determine if the soils are leaching VOCs to the ground water and appropriate action should be taken. If ICs are pursued to require land use restrictions on excavation and construction at the Site because there is contamination that does not allow for unlimited use or unrestricted exposure, specific soil concentration levels should be developed to indicate the threshold levels that would require IC restrictions on excavation and construction at the Site. EPA should follow appropriate guidelines for selecting and implementing ICs for soils since there are currently none required in the ROD.

Other Comments: None.

Third Five-Year Review Report
for
Tri-City Disposal Company Superfund Site

1.0 Introduction

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy will continue to be protective of human health and the environment. The methods, findings, and conclusions of these reviews are documented in FYR reports. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) prepares FYRs pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121 and the National Contingency Plan (NCP). CERCLA 121 states:

> "If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews."

EPA interpreted this requirement further in the NCP; 40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii), which states:

"If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such actions no less often than every five years after the initiation of the selected remedial action."

E^2 Inc., an EPA Region 4 contractor, conducted the FYR and prepared this report regarding the remedy implemented at the Tri-City Disposal Company Site in Brooks, Bullitt County, Kentucky. The PRP contractor, Earth Tech, has collected ground water data at the Site during the last five years. This FYR was carried out from October 2007 to April 2008. EPA is the oversight agency for implementation of the PRP-financed remedy at the Tri-City Disposal Company Superfund Site (Tri-City Site). KDEP, as the support agency representing the Commonwealth of Kentucky, participated in the site inspection and was invited to comment on the draft FYR.

The Tri-City Site was originally divided into two OUs. OU1 addressed the site contamination and the remedy documented in the 1991 ROD. OU2 was defined to address any contamination found during the confirmatory sampling of site soils, sediment, and ambient air, and their cleanup, if needed. The confirmatory sampling resulted in a No Action ROD for OU2 in 1996.

This is the third FYR for the Site. The triggering action for this review is the date of signature of the last FYR on April 29, 2003. Although the selected remedial action for ground water, upon completion, is not expected to leave hazardous substances, pollutants, or contaminants remaining on Site above levels that allow for unlimited use and unrestricted exposure, the remedial action requires five years or more to complete. Therefore, a review will be conducted every five years until concentrations have decreased to acceptable levels that allow for unlimited use and unrestricted exposure. This review will be placed in the site file and the local repository for the Site upon completion. The repository is located at the Ridgeway Memorial Library, 127 Walnut Street, Shepherdsville, Kentucky, 40165. The next FYR for this Site will be due in April 2013.

2.0 Site Chronology

The following table lists the dates of important events for the Tri-City Disposal Superfund Site.

Table 1: Chronology of Site Events

Event	Date
Operation of the Site as an industrial waste landfill	1964 to 1967
Lawsuit filed against the landfill and its owners results in the closing of the landfill	November 1967
KNREPC completed the Preliminary Assessment	September 11, 1985
KNREPC completed the Site Investigation	April 1987
EPA conducted additional investigations and provided local residents with drinking water	May 1988
EPA conducted an additional study to assess the Site's potential impact on area residents from ground water, dust, and direct contact	June 1988
The Site was proposed to the National Priorities List (NPL)	June 24, 1988
EPA conducted an Emergency Removal Action (ERA)	August and September 1988
The Site was finalized on the NPL	March 31, 1989
Ecological and Health Risk Assessment conducted	August 15, 1990
Remedial Investigation/Feasibility Study (RI/FS) published	August 28, 1991
ROD for OU1 signed	August 28, 1991
Removal Assessment completed	September 3, 1991
Unilateral Administrative Order (UAO) signed	March 16, 1992
Remedial Design Work Plan submitted	August 1992
Remedial Design Report for OU1 submitted	May 1993
Remedial Action Work Plan submitted	September 1993
Remedial Design Report for Unnamed Spring #1 submitted	March 1994
Remedial Action (construction) started	June 22, 1993
O&M Plan submitted	November 1994
Final Construction Report submitted	November 1994
Pre-Certification Inspection conducted	May 1995
Remedial Action completed	September 11, 1995
Cox residences connected to public water	1995
Final Construction Inspection Report approved	March 1996
EPA issued a No Further Action ROD for OU2	March 29, 1996
Close Out Report submitted	March 29, 1996
Consent Decree signed	October 30, 1997
First Five-Year Review signed	April 3, 1998
Klapper Spring remediation system (fence) constructed	May 1998
Problem noticed with Cox Spring treatment system	Summer 2000
Lightning protection installed at treatment control building	December 2000
KDEP requested additional soil sampling	December 11, 2000

Event	Date
Float switch installed at Cox Spring treatment system to fix problem noticed in summer of 2000	January 2001
KDEP and PRPs met to discuss additional sampling	April 26, 2001
KDEP conducted additional soil sampling	December 2001
KDEP conducted additional soil sampling	March 2002
Klapper residences connected to public water supply	May 2002
Second Five-Year Review signed	April 29, 2003
Design of Site's ICs began	October 2007
New PRP Focused Risk Assessment finalized	January 2008

3.0 Background

3.1 Physical Characteristics

The Tri-City Disposal Superfund Site is located in the community of Brooks in north-central Bullitt County, Kentucky, approximately l5 miles south of Louisville. CERCLIS lists the site address as "Route 1526 at the gravel road" in Shepherdsville, Kentucky. Shepherdsville is a slightly larger community located seven miles south of the Site. All of the families affected by the Site have addresses on Klapper Road in Brooks, Kentucky; therefore, this report will refer to the Site's location as Brooks, Kentucky, since that address more accurately reflects the location of the Site. The Site consists of approximately 349 acres and is located on the south side of State Highway l526 (also known as Brooks Hill Road), approximately four miles west of U.S. Interstate 65. More detail on the Site's location is provided in Figures 1 and 2. The geographical coordinates for the Site are 38° 2' 50.9" north latitude and 85° 46' 06.1" west longitude. There are at least ten separate parcels affected by the Site. Long time residents include the Cox, Klapper, and Hoosier families, each of whom owns a parcel for the parents' residence and one or more parcels that have been deeded to their children. The Cox, Sr. property is located immediately adjacent to the area that was used as an industrial waste landfill. This former landfill was the source of both the soil and ground water contamination at the Site.

The Site is located within the Outer Bluegrass physiographic region of Kentucky, which contains many deep valleys caused by interbedded limestones and shales. The Site contains several springs and seeps that emerge from the fractured shales and run down the valleys, but which are also prone to dry periods. The Site is located in a rural residential area and is not densely populated. The 2000 census reported that the town of Brooks covered almost five square miles and contained 2,678 inhabitants. On two sides, the Site is surrounded by forested land that contains Brushy Fork Creek and several springs. The Site does not contain any wetlands or endangered species and is not considered to be an environmentally sensitive area.

3.2 Land and Resource Use

The Site is located in an area of small farms, woodlands, and low-density housing. The Site is on the top of a ridge (locally referred to as Brooks Hill) that is used for farming, grazing, and rural residential activities. The land use at and near the Site has been largely the same for the last 20 years and no substantial changes to its current use are anticipated. The Cox family currently owns the majority of the Site and maintains two residences on the property. The family is tentatively planning construction of a third home on their property, which is adjacent to and includes a small area of the capped portion of the Site.

In addition, there are several residences located on adjacent property to the north and west of the Site. These families use their yards and the surrounding areas for vegetable gardens, a goat pasture, and recreational purposes.

Data indicate that ground water below the Site flows toward the south/southwest. The valleys that surround the ridge are very steep and densely wooded. Brushy Fork Creek is located in the valley south of the ridge, and three springs that emanate from the side of the ridge south of the Site are still impacted by the former landfill. These springs were formerly used as drinking water sources for several local families. The Commonwealth of Kentucky has classified the aquifer under the Site as a Class II-B aquifer, which is defined as a resource that should be maintained at drinking water quality levels. Potable water service for homes on the Site and homes near the Site is now provided by the Louisville Water Company via a system of public water mains. Private wells are not used to provide domestic water to homes on or near the Site because the bedrock generally does not yield adequate water. In addition, no public drinking water supply wells are located near or downgradient of the Site. All of the residents that previously used spring water for drinking water have now been connected to the public water supply.

Figure 1: Site Vicinity Map for Tri-City Disposal Co.

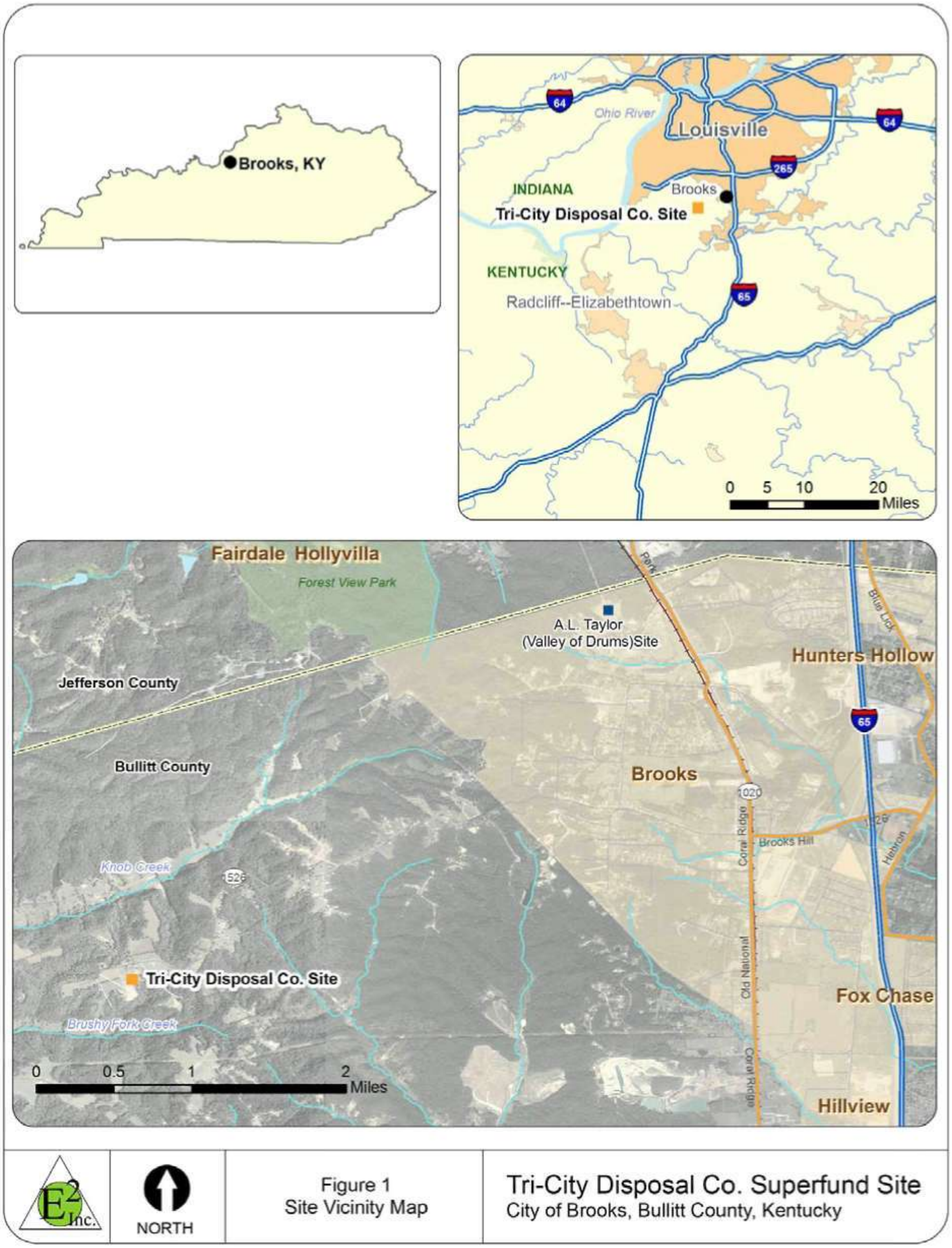
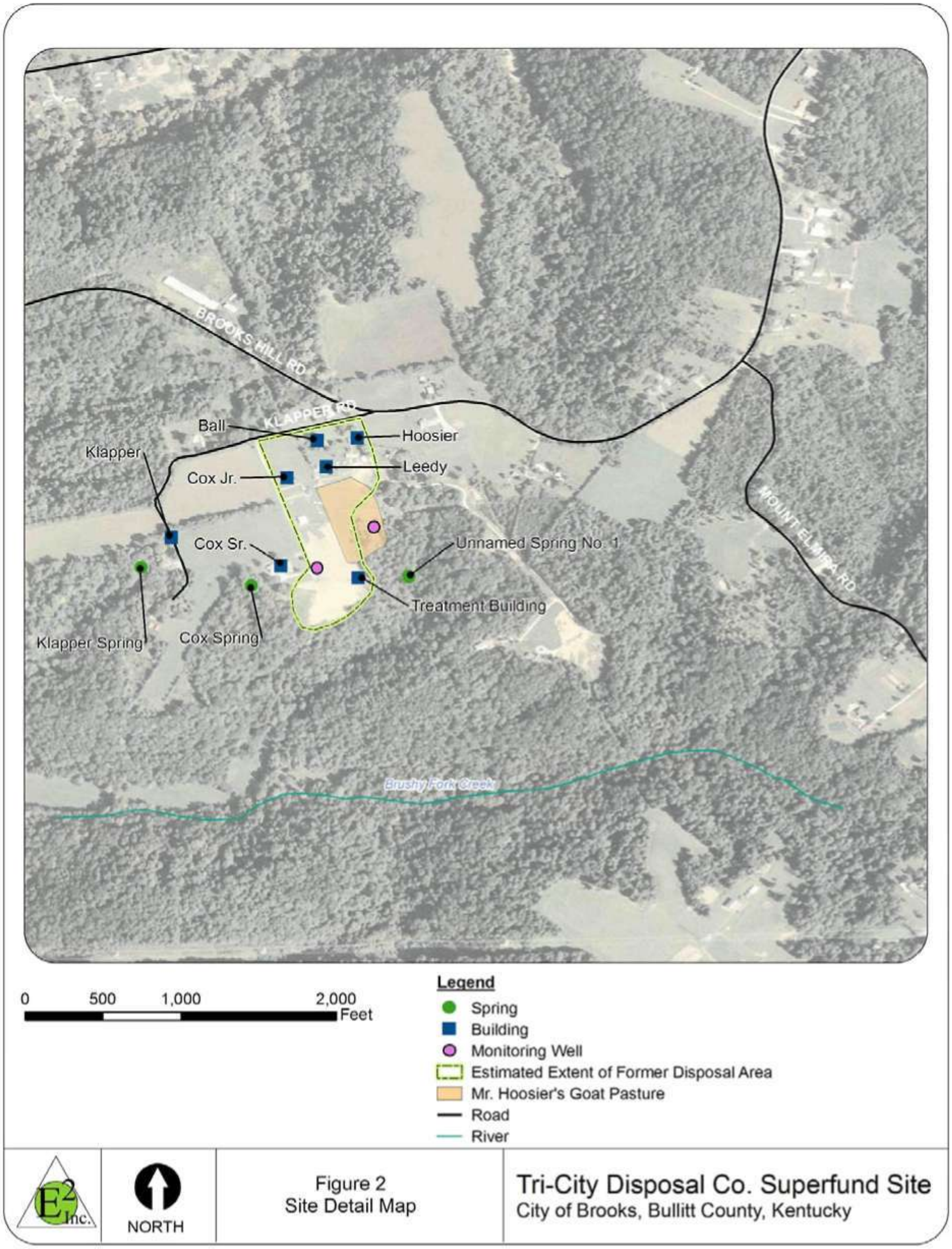


Figure 2: Detailed Site Map of the Tri-City Disposal Site



3.3 History of Contamination

Tri-City Industrial Services, Inc. operated an industrial waste landfill on the Site from late 1964 to late 1967. Most of the waste disposed of at the Site was scrap lumber and fiberglass insulation, but drummed liquid wastes and bulk liquids were also disposed of on the ground. Liquid waste included paint thinners and other volatile liquids and resulting contaminants included polychlorinated biphenyls (PCBs), phenols, heavy metals, and VOCs. During landfill operations, there were many citizen complaints concerning odors, fires, explosions, deposition of ash on adjoining properties, eye irritation, and breathing difficulties. These complaints led to a lawsuit for creating a public nuisance and an indictment was served to Tri-City Industrial Services, Inc. and others in November 1967. The company president, Mr. Harry Kletter, was arrested at that time, but was released after an agreement was negotiated that dropped all charges if the company stopped disposing of and burning waste at the Site. A fire broke out at the Site around the time of Mr. Kletter's arrest that burned for two years. The PRPs for the Site include Tri-City Industrial Services, Inc. and those companies who sent waste to the Site for disposal. In November 1988 and May 1989, the PRPs were notified via special notice letters and given the opportunity to conduct the RI/FS with EPA oversight. However, none of the PRPs elected to undertake these activities. In 1992, three of the PRPs, Waste Management of Kentucky, Dow Corning, and Ford Motor Company, were directed by a Unilateral Administrative Order (UAO) to fund and implement the Remedial Design and Remedial Action (RD/RA) required by the OU1 ROD. The PRPs are not landowners at the Site, but they continue to fund the implementation of the remedial action.

3.4 Initial Response

The lawsuit led to closure of the landfill in 1967. EPA became involved with the Site in September 1985 at the request of the Kentucky Natural Resources and Environmental Protection Cabinet (KNREPC). The KNREPC conducted a Preliminary Assessment of the property in September 1985 and conducted a Site Investigation in April 1987. The Site Investigation revealed that there were hazardous substances in the soil and contamination in the Klapper Spring.

3.4.1 Ground Water

The Klapper Spring was impacted by tetrachloroethene (PCE) at concentrations that exceeded the federal drinking water standards. The Klapper family was using the Klapper Spring as a source of domestic water at that time. EPA conducted additional sampling and provided the Klapper family with an alternate water supply in May 1988. EPA also discovered that the Cox family was using water from Cox Spring as a potable water source and immediately provided them with an alternative water supply. EPA conducted a survey of potable water sources within an approximately one-half mile radius of the Site. This survey again showed PCE in the Klapper Spring and elevated levels of PCE and trichloroethene (TCE) in the Cox Spring. In June 1988, EPA conducted an additional study to assess the Site's potential impact on area residents from ingestion of ground water, inhalation of dust, and direct contact with soil. This investigation found that the greatest potential hazard came from ingestion of contaminated ground water. The Site was placed on the NPL in March 1989.

3.4.2 Soil

In August and September 1988, EPA conducted an Emergency Removal Action (ERA) from an area immediately south of the Cox, Sr. residence. The ERA was initiated when the Cox family reported that "black ooze" was emanating from their side yard. EPA contractors investigated the substance and found that it contained elevated levels of xylene, toluene, ethylbenzene, and lead. EPA contractors then conducted geophysical surveys and field analytical screenings in August 1988 and found that waste disposal was concentrated on the southern half of the Site. The ERA involved excavating and removing approximately 165 drums, many crushed and empty drums, metal containers of various sizes, auto parts, 400 gallons of free liquids, and over 800 cubic yards of contaminated soil. Contaminated soils were identified through geophysical surveys and test trenches, which were excavated in areas with geophysical anomalies. Soil in these trenches contained empty drums, drums containing solids, fiberglass insulation, wires, and ash, but no additional drums of liquid waste were found.

Once the removal action was complete, EPA began the RI/FS in July 1989 to characterize the Site and determine the nature and extent of contamination. The RI/FS was completed in May 1991.

3.5 Basis for Taking Action

The original basis for action was presented in the 1991 Risk Assessment and addressed both soil and ground water. The conclusions of this Risk Assessment are presented in the subsections below. In January 2008, a new Focused Risk Assessment was developed for the Site, a summary of which is presented in section 3.5.3.

Remedial Action Objectives

The remedial action objectives (RAOs) were established in the 1991 ROD and included restoration of the ground water to its beneficial uses within a reasonable timeframe through removal of VOCs from the spring water at the Site. The RAOs also included the expectation that MCLs and MCLGs would be achieved in the Cox Spring within ten years of 1991 (the date of the original ROD). In order to address human health concerns, prevent exposure to contamination at the Site, and protect ground water resources at the Tri-City Disposal Site, the selected remedy in the 1991 ROD required that cleanup goals be met in ground water. These cleanup goals were identified in the ROD as federal MCLs and health-based, non-zero MCL Goals (MCLGs) that were applicable or relevant and appropriate at the time of the ROD. No cleanup goals were established in the ROD for soil because it was determined that the removal action had sufficiently addressed soil contamination at the Site.

3.5.1 Ground Water

The primary medium of concern was ground water, which was used as a drinking water source through consumption of water from the impacted springs. The water in some of the springs at and near the Site was and is contaminated with VOCs, including PCE and TCE, at concentrations above MCLs. MCLs are enforceable standards promulgated under the Safe Drinking Water Act. These standards apply to specific concentrations of certain contaminants that have an adverse effect on human health. If established for a contaminant, MCLs are included as applicable or relevant and appropriate requirements (ARARs) for the Site. MCL Goals (MCLGs) are non-enforceable health-based goals that protect against adverse human health effects and allow an adequate margin of safety. MCLs and MCLGs were established as cleanup goals for contaminants in ground water at the Site within the selected remedy of the 1991 ROD. The majority of the risk at this Site resulted from exceedances of the MCL for vinyl chloride. The MCL for this contaminant was set at 2 ppb. The MCLs and MCLGs that were used in developing the ROD for this Site are presented in Table 2.

Table 2: Cleanup Goals (MCLs and MCLGs) for Ground Water from 1991 ROD

Contaminants of Concern	MCL (ppb)	MCLG (ppb)	Risk or HQ*
Chloroform	100	--	1.7×10^{-5}
1,1-Dicholorethene	7	7	0.02
Cis-1,2-Dichloroethene	70	70	0.2
Trans-1,2-Dichloroethene	100	100	0.14
PCE	5	0	7.5×10^{-6}
Toluene	1,000	1,000	0.14
1,1,1-Trichloroethane	200	200	0.07
TCE	5	0	1.6×10^{-6}
Vinyl Chloride	2	0	1.1×10^{-4}
Xylenes	10,000	10,000	0.14
Bis(2-Ethylhexyl)Phthalate	4**	0**	1.6×10^{-6}
	Total Carcinogenic Risk		1.4×10^{-6}
	Total Hazard Index (HI)		0.71

* Risk levels and hazard quotients (HQ) are based on the ingestion of 2 liters of water every day for a lifetime (70 years) by an individual weighing 70 kg. Risk levels are for carcinogenic compounds. Hazard quotients are for non-carcinogenic compounds.
** Indicates a proposed MCL or MCLG.
--Indicates that a MCL or MCLG has not been established.

Inhalation and ingestion of surface water and ground water were considered future pathways of concern. The risks associated with this Site primarily included an increased risk of cancer and liver disease due to inhalation or ingestion of VOC- contaminated ground water.

3.5.2 Soil

The primary human receptors identified in the 1991 Risk Assessment included the four families that were living near the Site at the time of its discovery. The 1991 risk assessment indicated a potential health risk associated with raising beef cattle and cultivating gardens on site. However, this potential risk was based on the detection of contaminants in one out of the 20 on site surface soil samples that were collected. As a result of this low frequency of detection, it was recommended that the presence of surface soil contamination be verified. No cleanup goals/standards were established for soils in the 1991 OU1 ROD because the OU1 selected remedy required additional confirmatory sampling of site soils, sediment, and ambient air. The cleanup of these media, if needed, would be addressed under OU2, and the results of this sampling would be used for the OU2 ROD. However, the OU2 ROD resulted in no action.

3.5.3 2008 Risk Assessment

The original Risk Assessment for the Site was conducted by Ebasco in 1991. It concluded that exposure to the spring water during domestic use presented risks that exceeded EPA guidelines. In early 2006, EPA requested that the PRPs conduct a new human health Focused Risk Assessment for spring water at the Site, which was finalized in January 2008. The new Focused Risk Assessment concluded that PCE, TCE, cis-1,2-dichloroethene (DCE), and vinyl chloride are the only spring water contaminants of potential concern. The 2008 Risk Assessment only evaluated risks associated with the ground water and spring water. Exposure to surface and subsurface soils, contaminants leaching from soils to ground water, and vapor releases from soil and/or ground water were not evaluated. Ground water was considered an incomplete exposure pathway because ground water in the area of the Site has not been used for drinking water due to insufficient yield and use of the ground water for drinking water is not anticipated in the future.

The Focused Risk Assessment found that VOCs volatilize from the spring water a few hundred feet downstream of the source and before the springs' confluence with Brushy Fork Creek. The Focused Risk Assessment used a conservative spring water exposure scenario and the highest contaminant concentrations detected in the past ten years to calculate the risk from intermittent and incidental ingestion, inhalation, and dermal contact associated with the spring water. The Focused Risk Assessment concluded that potential exposure from intermittent and incidental ingestion, inhalation, and dermal contact associated with the spring water does not exceed risk-based levels and does not pose an unacceptable risk to the health of receptors at the Site. The spring water exposure scenario was based on the assumption that local residents might contact spring water intermittently and in an incidental fashion. Ingestion of significant quantities of the spring water was not considered realistic or reasonable because spring discharge occurs from steep hillsides that are relatively inaccessible. The Focused Risk Assessment attributes the change in risk between 1991 and 2008 to two factors: the decline in VOC concentrations over the intervening 17 years, and the fact that the spring water is no longer used for domestic purposes. The table below illustrates the contaminant of concern (COC) concentrations used for the 1991 and 2008 Risk Assessments; the lower values used in 2008 reflect the overall decline in spring water VOC concentrations between 1991 and 2008.

Table 3: Maximum Detections of COCs in Springs Used for Risk Assessments*

Chemical	Concentration Used in 1991 Risk Assessment	Concentration Used in 2008 Risk Assessment
Cis-1,2-Dichloroethene	280 µg/l	82 µg/l
PCE	560 µg/l	260 µg/l
TCE	47 µg/l	63 µg/l
Vinyl Chloride	32 µg/l	2.3 µg/l
* Table 8-1 from the 2008 Focused Risk Assessment		

4.0 Remedial Actions

In accordance with CERCLA and the NCP, the overriding goals for any remedial action are protection of human health and the environment and compliance with ARARs. A number of remedial alternatives were considered for the Tri-City Site, and final selection was made based on an evaluation of each alternative against nine evaluation criteria that are specified in Section 300.430(f)(5)(i) of the NCP. The nine criteria include:

1. Overall Protectiveness of Human Health and the Environment
2. Compliance with ARARs
3. Long-Term Effectiveness and Permanence
4. Reduction of Toxicity, Mobility or Volume of Contaminants through Treatment
5. Short-term Effectiveness
6. Implementability
7. Cost
8. State Acceptance
9. Community Acceptance

4.1 Remedy Selection

4.1.1 OU1

Based on the results of the RI/FS and to expedite action, the Site was divided into two OUs. OU1 included the remediation of contaminated ground water and confirmatory sampling to identify any unacceptable contaminant concentrations in areas of the property that were not previously addressed. OU2 was defined to address any contamination found during the confirmatory sampling of site soils, sediment, and ambient air, and their cleanup, if needed.

The RAOs identified for OU1 in the 1991 ROD included restoration of the ground water to its beneficial uses within a reasonable timeframe through removal of VOCs from the spring water at the Site. The RAOs also included the expectation that MCLs and MCLGs would be achieved in the Cox Spring within ten years of 1991 (the date of the original ROD). In order to address human health concerns and protect ground water resources at the Tri-City Disposal Site, the selected remedy in the 1991 ROD required that cleanup goals be met in ground water. These cleanup goals were identified in the ROD as federal MCLs and health-based, non-zero MCL Goals (MCLGs) that were applicable or relevant and appropriate at the time of the ROD. The selected remedy in the 1991 ROD required that the contaminated ground water be treated to MCLs and non-zero MCLGs in order to reduce carcinogenic risk to 1.4×10^{-4} or below and to reduce the Hazard Quotient to less than one. The ROD for OU1, which was signed in August 1991, presented the following components for the selected remedy:

1) Institutional Controls (ICs) – ICs to restrict the potable use of ground water containing, or potentially containing, levels of contamination in excess of MCLs and non-zero MCLGs. Institutional controls may include local ordinances, conservation

or restrictive easements, record notice, or some other appropriate measure. The restrictions will remain in effect until EPA, through monitoring, determines that the water is of sufficient and consistent quality for human consumption.

2) Continued provision of potable water to residents who previously used contaminated ground water as a source of potable water until EPA, through monitoring, determines that the water is of sufficient and consistent quality for human consumption.
3) Long-term Monitoring – Monitoring will include quarterly sampling of the five nearby springs for one year, semi-annual sampling for two more years, and annual monitoring for up to 27 years. Ground water monitoring wells, surface water, and sediment from Brushy Fork Creek will also be monitored annually for up to 30 years.
4) Confirmatory Sampling – Sampling to assess efficacy of the ERA included soil samples from areas around the Cox, Sr. residence and the former landfill as well as air and sediment samples to follow up on isolated exceedances found during the RI.
5) Treatment of Spring Water with Carbon Adsorption – Contaminated spring water will be treated with carbon filters and then returned to the springs by a system of pumps. This treatment should continue until MCLs and non-zero MCLGs are attained, which was expected to take 10 years. This component of the remedy includes monitoring of carbon filters and sampling of spring influent and effluent. The Point of Compliance for these springs is where the ground water discharges to the surface as springs.

The Commonwealth of Kentucky generally concurred with the selected remedy, but maintained that KRS Statute 224.877 is a state ARAR that is more stringent than federal standards. The Commonwealth requested EPA's compliance with Section 10 of this statute:

> The remedial action shall protect human health, safety, and the environment considering the following factors as appropriate: the characteristics of the pollutants, hydrogeologic features of the area, current and future uses of surface and ground water, potential effects of residual contamination, health effects and environmental consequences, an exposure assessment, and any other available information.

EPA did not view this statute as more stringent because it lacks any numeric enforceable standards that differ from federal standards.

Remedial Design for the remedy described above began in March 1992, and was completed by June 1993.

4.1.2 OU2

No remedy was selected for OU2 based on the results of the confirmatory sampling carried out during the implementation of the remedy selected for OU1. The ROD for OU2 was a No Action ROD.

4.2 Remedy Implementation

The PRPs contracted with Rust Environmental and Infrastructure (now Earth Tech) to conduct the Remedial Design, which was completed on June 22, 1993. Rust Environmental and Infrastructure began by initiating the long-term monitoring activities and conducting the necessary sampling. The results of this sampling led to the conclusion that the Cox Spring and the Unnamed Spring No. 1 required immediate pump and treat remediation and that the Klapper Spring required further monitoring. The Remedial Action Work Plan was finalized in 1993 and a UAO for the remedy's implementation was signed in March 1993.

4.2.1 Institutional Controls

One component of the 1991 ROD's selected remedy required ICs to restrict the use of ground water containing, or potentially containing, levels of contamination in excess of MCLs or MCLGs until monitoring indicates that the water is reliably safe for human consumption. Some steps were taken during remedy construction to prevent the use of spring water as drinking water. The collection system used at the Cox Spring to provide water to the Cox residences was dismantled, making it impossible for water from the Cox Spring to be used by the Cox families for domestic purposes. The Klapper Spring collection system was also taken out of service and the spring was surrounded by a chain link fence, making it inaccessible as a drinking water source. The Unnamed Spring No. 1 was never used as a domestic water source. These actions made it very unlikely that spring water would be used as drinking water. Both the Cox and Klapper residences were also connected to the public water supply.

In 1992, the Cox and Klapper families signed an agreement with the PRPs promising cooperation with the implementation of the remedy, including implementation of ICs. Between 1992 and 1998, several covenants and easements were put in place granting the PRPs access to the Klapper, Cox, and Hoosier properties for the purposes of monitoring, sampling, and remedy construction. These agreements are short-term deed documents with either a five-year time frame renewable for a period up to 25 additional years or a flat 25-year time period. Neither the Cox nor Klapper families have yet been asked to implement any ICs for their properties.

In December 2003, the PRPs undertook a review of land use restrictions on the properties associated with the Site to determine whether any limitations on excavation and building construction existed at that time. That review revealed the following deed documents in place:

- Access agreements on the following properties: William Cox Sr., William Cox Jr., Mr. and Mrs. Larry Klapper, Loretta Klapper, Stanley Thiry, James Beghtol, Ardelia Milliner, and Wenefrey Hoosier. The access agreements relate to ground water, surface water, and sediment sampling activities on these properties.

- An easement on the William Cox Sr. property for the installation and operation of a ground water treatment system.
- A settlement agreement with Mr. and Mrs. Larry Klapper and Loretta Klapper, in which they agree to cooperate with any actions required by EPA or the Commonwealth of Kentucky that include, but are not limited to, providing site access and implementing ICs.
- A settlement agreement with William Cox Sr. and William Cox Jr. in which they agreed to cooperate with any actions required by EPA or the Commonwealth of Kentucky that include, but are not limited to, providing site access and implementing ICs.
- An easement with Mr. and Mrs. Larry Klapper and Loretta Klapper for installation of a remediation system.

Based on this review of land use restrictions, the PRPs determined that there were no restrictions on excavation or building construction in place on any of the properties associated with the Tri-City Site. There are settlement agreements with the Cox and Klapper families that may allow ICs to be placed on those properties to preclude excavation and construction. Nevertheless, there are no formal ICs in place at this time to restrict the use of spring water as potable water or to restrict excavation and building construction on these properties. If ICs are pursued to require restrictions on excavation and construction at the Site, specific soil concentrations should be developed that indicate the threshold values for these restrictions.

4.2.2 Long-Term Monitoring

Long-term monitoring began in 1993 and is ongoing in accordance with the 1992 Field Sampling Plan. The plan calls for long-term monitoring of five springs and six ground water monitoring wells, as well as ecological monitoring of surface water, sediment, and toxicity. A summary of the current status of the long-term monitoring program is outlined below. The Cox Spring, Unnamed Spring No. 1, and Klapper Spring are currently undergoing remediation and therefore are not included in the long-term monitoring program. However, spring water samples are being collected as part of the treatment program to track contaminant concentrations and once cleanup goals established in the 1991 ROD are met, long-term monitoring will begin at these springs.

- <u>Brading Spring No. 2</u> – Brading Spring No. 2 was sampled from 1992 through 1998. There were no exceedances of the MCLs or non-zero MCLGs from 1994 to 1998. As a result, long-term monitoring of Brading Spring No. 2 was discontinued.
- <u>Cattle Spring</u> – Cattle Spring was sampled according to the long-term monitoring program from 1992 through 1998. Since no exceedances of the MCLs or non-zero MCLGs were recorded, the long-term monitoring of Cattle Spring is complete.

- Abandoned Monitoring Wells – Ground water samples have been collected from six ground water monitoring wells at the Site. MW-05 had no detections that exceeded the MCLs or non-zero MCLGs through 1997, so long-term monitoring of MW-05 is complete. Monitoring wells MW-08, MW-11, and MW-12 had no exceedances during the five years that they were sampled. Therefore, long-term monitoring is complete for these wells, which were properly abandoned after the previous FYR, in accordance with its recommendations.
- Active Monitoring Wells – MW-02 has shown detections of VOCs exceeding MCLs or non-zero MCLGs each time it has been sampled, so it continues to be monitored on an annual basis. MW-04 has had periodic detections of VOCs that exceed the MCLs or non-zero MCLGs. For monitoring wells MW-02 and MW-04, monitoring is ongoing and will continue until there have been five consecutive sampling events without an exceedance of the MCLs or non-zero MCLGs.
- Ecological Monitoring – Baseline ecological monitoring was conducted in 1992, with additional monitoring events in 1993 and 1997. The monitoring involved collecting surface water and sediment samples for VOC, semi-volatile organic compound (SVOC), and metal analyses, as well as collecting water samples for toxicity testing. The fifth annual sampling event was conducted in July 1997 and the results indicated that there were no exceedances of the MCLs or non-zero MCLGs in the surface water and sediment, and that the surface water was not toxic. These results demonstrated that the Site does not have an adverse effect on the ecology of Brushy Fork Creek and therefore ecological monitoring was discontinued.

4.2.3 Confirmatory Sampling

The OU1 confirmatory samples were collected in 1992 and were evaluated by EPA to determine if there was a need for any actions under OU2. The confirmatory sampling included surface soil, subsurface soil, surface water, and sediment samples.

Because sampling data reviewed as part of this FYR indicate that PCE, TCE, and DCE persist in site ground water at concentrations greater than cleanup goals, the possibility exists that a source of these COCs remains in the soil. During the confirmatory sampling, six of the 21 subsurface soil samples collected from the removal area near the Cox, Sr. residence contained DCE concentrations ranging from 64 μg/kg to 1,300 μg/kg; the average DCE concentration for these six samples was 537 μg/kg. In addition, one subsurface soil sample collected from the removal area contained a TCE concentration of 740 μg/kg. None of the 21 subsurface soil samples collected from the removal area contained PCE concentrations greater than the quantitation limit. Of 11 subsurface soil samples collected from a disturbed area in the northern portion of the Site, DCE and TCE were not detected at concentrations above quantitation limits, and two samples contained PCE at concentrations of 35 μg/kg and 86 μg/kg, with an average concentration of 60 μg/kg. All of these concentrations exceed current Region 4 DAF1 (Dilution Attenuation Factor of one) soil screening levels (SSLs) (see Table 15 for more information on these standards).

The 1996 OU2 ROD states that the major concern regarding these compounds was their potential effect on ground water. As a result, fate and transport processes and ground water monitoring reports for these compounds were reviewed. The results of this review indicated that the VOCs that constituted the majority of the subsurface soil contaminants are soluble and leachable to water. However, EPA concluded that the VOCs in subsurface soil did not constitute a significant concern at the time of the 1996 ROD; this was partially based on one year of ground water monitoring results, which indicated that concentrations of these compounds in ground water were no longer a threat to human health or the environment.

Based on the results of the confirmatory sampling, EPA concluded that there was no unacceptable risk to human health or the environment from these media and determined that there was no need to initiate an OU2 response. Therefore, a No Action ROD was issued for OU2 in March 1996. Remedial action is ongoing at the Site to address the remaining requirements of the OU1 remedy.

As discussed in the Issues for the present FYR, persistent ground water and spring water VOC contamination in excess of MCLs indicates that this residual soil contamination may be a continuing source of VOC contamination.

4.2.4 Treatment of Contaminated Spring Water

The first action to address contaminated spring water at the Site was provision of an alternative drinking water source for those families who had been using the contaminated spring water for domestic purposes. Initially, the residences were provided water via cisterns that were replenished with potable water via tanker truck on an as-needed basis. The two Cox residences and the two Klapper residences are now connected to the public water supply through the Louisville Water Company. The Cox residences were connected to the water main in 1995 and the Klapper residences were connected to the water main in May 2002. These activities were funded by the PRPs.

In May 1994, remedial actions began to treat water from two of the impacted springs at the Site (Cox and Unnamed No. 1). PCE and TCE concentrations in these springs continue to exceed the MCLs and non-zero MCLGs, and remediation is ongoing. The Klapper Spring has been undergoing treatment since April 1998. The treatment of the Cox Spring and Unnamed Spring No. 1 involves collecting the spring water, pumping it through a granular activated charcoal (GAC) treatment system, and returning it to the springs. The remedial action for the Klapper Spring, which is also ongoing, involves access controls with a chain link fence around the first 50 feet of the spring and natural air stripping as the water flows downstream.

To address operational problems with the treatment system that resulted from external forces (e.g., lightning and power failures), several measures have been taken to improve the durability of the treatment systems. Lightning strikes caused problems with the electrical equipment in the control shed; as a result, lightning protection was installed in December 2000. In the summer of 2000, Mr. Cox installed a pond on his property and in the process, accidentally cut the buried electrical line that connected the treatment system at the Cox Spring to the treatment building. The origin of the problem was not identified for some time, but in January 2001, a float switch was installed in the holding tank at the Cox Spring to address this problem without burying an additional electrical line. In May 2003 and October 2005, a new pump starter was installed at the Cox Spring to maintain the treatment system's operational condition. In September 2003 and May 2004, electrical problems with the treatment systems caused them to be non-operational for three months until the problem could be identified, parts ordered, and the system repaired and restored to operation. The first electrical problem affected only the Cox Spring, while the second problem affected both the Cox and Unnamed Spring No. 1. The PRPs were not satisfied with the performance of the O&M contractor at the Site, and to obtain better services for sampling and maintenance, hired American Environmental Group Ltd. (AEGL) in November 2004. The GAC drums have been replaced twice in the last five years, in December 2004 and January 2006.

The selected remedy in the 1991 ROD states that since the treated water is discharged to a surface water body (i.e., the springs), this effluent must meet National Pollution Discharge Elimination System (NPDES) standards established by the Clean Water Act and regulated by the Commonwealth of Kentucky. The influent to the treatment systems and the ground water from the monitoring wells is required to meet MCLs. However, the effluent from the treatment systems for the Cox Spring and Unnamed Spring No. 1 is required to meet NPDES performance standards, which are, in some cases, lower than the MCLs. This is the case for the two most persistent COCs at the Site, PCE and TCE. The site's treatment system effluent discharge limit ARARs are the NPDES discharge levels that are presented in the table below.

Table 4: NPDES Treatment System Effluent Discharge Limits in 1991 for Tri-City Disposal Co. Site

COC	NPDES (µg/L)
Chloroform	15.7
1,1-Dichloroethene	1.85
Cis-1,2-Dichloroethene	1.85
Trans-1,2-Dichloroethene	1.85
PCE	8.85
Toluene	424,000
1,1,1-Trichloroethane	1,300,000
TCE	80.7
Vinyl Chloride	525
Xylenes	No criteria

The O&M Plan for the Site includes monthly monitoring of the treatment system effluent. Each month during the on-site inspection, the effluent from the treatment systems for the Cox Spring and Unnamed Spring No. 1 are sampled and analyzed for the COCs listed in the table above. Each month, water from the Klapper Spring is collected where it discharges out of the fence and analyzed. Once a year, usually in the fall, the annual long-term monitoring is also performed. This involves sampling only the influent of each of the three springs as well as taking samples from the two active monitoring wells. These annual samples are also analyzed for the COCs listed in the table above.

Spring water is considered remediated if annual sampling shows that, for the influent, the concentrations are below the MCL or non-zero MCLG for five consecutive sampling rounds. During the last five years, each of the springs and monitoring wells has had exceedances during the annual influent monitoring events. Also, the treated effluent sampled during the monthly monitoring events for the three springs has had occasional exceedances of the NPDES discharge limits. Results of these sampling events are discussed in more detail in Section 6.4.

4.3 Operation and Maintenance (O&M)

The PRPs are conducting O&M of the treatment systems, monitoring of the treatment system effluent, and performing long-term monitoring of the influent according to the O&M Plan. These activities started in 1996 and are ongoing. The O&M activities include:

- Performing monthly on-site inspections of the Site, the treatment systems, and the treatment building;
- Maintaining the treatment systems for the Cox Spring and Unnamed Spring No. 1;

- Inspecting the access controls at the Klapper Spring;
- Collecting effluent samples from the treatment systems on a monthly basis;
- Conducting annual sampling of the influent for long-term monitoring;
- Performing repairs and maintenance on treatment systems and treatment building on an as needed basis; and
- Recording O&M activities monthly on a system operation and inspection log and in quarterly progress reports.

These activities are required under the terms of the 1993 UAO as amended in December 1997. The following table summarizes the main actions taken during these monthly site inspections over the last five years.

Table 5: O&M Activities

O&M Event	Date
Faulty pump starter for Cox Spring repaired.	May 2003
Electrical problems with Cox Spring pump system cause treatment system to be down for three months before problems were repaired.	September 2003
Four ground water wells properly abandoned (MW-5, 8, 11, 12).	September 2003
Deed documents reviewed, revealed no ICs in place.	December 2003
"Signs will be posted around the Site to warn residents against excavation and building construction close to the Site," added to work schedule and included in each subsequent quarterly progress report.	December 2003
Electrical problems with controller on Cox and Unnamed Spring No. 1 pump systems cause treatment systems to be down for three months before they were repaired.	May 2004
O&M contractor replaced by AEGL due to unsatisfactory performance of previous contractor.	November 2004
Carbon drums in treatment building replaced.	December 2004
Maintenance and improvements performed on physical structure of treatment building.	February 2005
Pump starter at Cox Spring treatment system replaced.	October 2005
Carbon drums in treatment building replaced.	January 2006

The O&M costs incurred for the Site include monthly inspection and maintenance, replacement of GAC drums, collecting and analyzing monthly effluent samples, collecting and analyzing annual influent samples, and reporting these results in quarterly progress reports. Before the previous O&M contractor was replaced by AEGL in November, 2004, there were two, three-month periods of time during which the treatment systems did not function because repairs were not performed in a timely fashion. In addition, several of the monthly spring effluent monitoring samples were lost by the previous O&M contractor. Since the previous O&M contractor was replaced, O&M has improved at the Site. During the site inspection for the present FYR, it was noted that signs warning residents against excavation were not posted. However, signs have been posted since the site inspection. Currently, O&M is being performed as specified by the UAO. The ROD for OU1 predicted the following costs for O&M at the Site in 1990 dollars.

Table 6: Projected O&M Costs

O&M Activities*	Cost in Dollars
Annual monitoring	$23,896
Long-term monitoring	$40,014
Costs associated with Five-Year Reviews	$10,000
Total Projected Cost For 2007	**$73,910**
* Costs excerpted from Table 19 in 1991 ROD	

The following table summarizes the actual O&M costs incurred at the Site during the past five years.

Table 7: Actual O&M Costs

Date	Total Cost
2003	$23,524
2004	$38,069
2005	$31,479
2006	$42,907
2007	$61,862
Total	**$197,841**

The higher costs incurred in 2007 are associated with additional tasks performed that year, such as supporting the FYR, developing the Focused Risk Assessment, and designing ICs. The monitoring, sampling, and reporting costs incurred in 2007 were similar to those of previous years. The total costs for 2007 are lower than those projected for the Site despite inflation, and therefore illustrate efficiencies that have already been put in place for the Site's O&M, rather than the need for any modifications to current procedures.

5.0 Progress Since the Last Five-Year Review

The second FYR for the Tri-City Disposal Site was signed on April 29, 2003, and summarized the progress on implementation of the OU1 ROD, concluding that most of the remedial requirements had been implemented. The remaining remedy components identified by this FYR included continued treatment of the Cox Spring, Unnamed Spring No. 1, and Klapper Spring, and continued sampling of the treatment system effluent as well as MW-02 and MW-04. This FYR raised the issue of KDEP's concerns about remaining soil contamination. These concerns were based on PCB and lead detections in soil samples collected during 1998 and 1999 near the treatment shed, and in samples collected in the goat pasture during 2001 and 2002. During the second FYR, KDEP also raised concerns over the lack of ICs preventing excavation and construction at and near the Site and met with the PRPs to discuss these issues.

Protectiveness Statement from the last Five-Year Review

In the last FYR the protectiveness statement described the Site as protective of human health and the environment. The full protectiveness statement from the previous FYR report is provided below:

> "The remedy at the Tri-City Disposal Site currently protects human health and the environment. Remediation measures at the site continue to remove the compounds of concern from the three impacted springs. There have been infrequent exceedances of the performance standards but these exceedances are not considered to be a threat to human health or the environment. Water has been provided through a water main to the residents that were affected by the contaminated springs. The impacted springs are not currently being used as a source of water. The temporary ground water use restrictions are still in place and there is no known use of the ground water in the affected area. Performance samples and long-term samples continue to be collected as required by the ROD. The results of the long-term sampling show that the concentrations of contaminants in the ground water are, in general, declining with time."

Recommendations from the Previous Five-Year Review

The following table provides a summary by issue of the recommendations made in the 2003 FYR and the status of these recommendations.

Table 8: Recommendations and Follow-up Actions from 2003 FYR

	Recommendations in 2003 FYR	Actions Between FYRs	Status of Issue in 2008
5.1	**Abandon Inactive Monitoring Wells:** Abandon the four unused monitoring wells.	Monitoring wells that had completed five consecutive sampling events without an exceedance were properly abandoned in the summer of 2003.	Only MW-02 and MW-04 remain active.
5.2	**Continue O&M Inspections**	O&M inspections continued.	Monthly O&M inspections are ongoing.
5.3	**Continue Performance and Long-Term Monitoring**	Monitoring continued for springs and wells that had not met the requirement of five years with no exceedances.	Monitoring is ongoing at Klapper Spring, Cox Spring, Unnamed Spring No. 1, MW-02, and MW-04.
5.4	**KDEP Soil Sampling:** Review the KDEP soil sampling results.	The PRP reviewed the KDEP soil sampling results in December 2003 and found only one exceedance of EPA Region 3 standards.	EPA reviewed the KDEP soil data and found it too limited to support any conclusions about the effect of the soils on human health or the environment.
5.5	**ICs:** PRPs should review ICs and address deficiencies as necessary.	The PRPs hired an attorney to draft necessary ICs for the restriction of the use of land and spring water at the Site.	Attorneys for the PRPs, EPA, and the state are designing the Site's ICs.
5.6	**Warning Signs:** PRPs should install signs around the Site to warn residents against excavation and construction near the Site.	EPA requested that the PRPs install the warning signs.	The warning signs were developed and installed in 2008. Evidence of construction on the capped portion of the Site was present during the site inspection.

The numbers and titles in the tables above correspond to the subsections below, in which each recommendation from the 2003 FYR is discussed in more detail.

5.1 Abandon Inactive Monitoring Wells

The second FYR recommended abandoning the monitoring wells for which long-term monitoring was complete. The PRP contractor properly abandoned each of these monitoring wells (MW-01, MW-03, MW-05, and MW-06) during the summer of 2004. According to Mr. Shaw, project manager for the PRP contractor, these wells were located near the Cox residences. After this work, only two monitoring wells remained active at the Site: MW-02 and MW-04. These wells continue to have exceedances and therefore will continue to be monitored until they have achieved the necessary five rounds of sampling results with concentrations below cleanup goals established in the 1991 ROD.

5.2 Continue O&M Inspections

Site inspections have occurred regularly since the 2003 FYR and are ongoing.

5.3 Continue Performance and Long-Term Monitoring

The 2003 FYR recommended continuation of performance monitoring for the treatment remedy and long-term monitoring for the remaining monitoring wells until cleanup goals established in the 1991 ROD were met. This sampling and monitoring has continued and is ongoing. Current long-term monitoring includes annual sampling of the treatment system influent for the Cox, Klapper and Unnamed No. 1 Springs; annual sampling of monitoring wells MW-02 and MW-04; and monthly sampling of the treatment system effluent.

5.4 KDEP Soil Sampling

In 1998, 1999, 2001, and 2002, KDEP collected and analyzed Site surface and subsurface soil samples for dioxins, furans, PCBs, and metals. Some of these samples contained elevated concentrations of PCBs and lead. No site COCs were analyzed during these sampling events. In the 1998 and 1999 sampling, KDEP detected lead and PCBs in surface soils collected east and south of the treatment building. In 2001 and 2002, KDEP analyzed surface and subsurface soil samples (0 to 4 feet below ground surface) from the goat pasture located north of the treatment building; some of the subsurface soil samples also contained elevated concentrations of lead and PCBs. The second FYR conveyed some of KDEP's concerns about these soil sampling results. The KDEP has expressed concerns about elevated levels of lead and PCBs in soils as well as the lack of excavation and construction restrictions for the land at and near the Site. EPA and the PRPs are aware of these concerns and have evaluated the KDEP data. In 2003, the PRPs reviewed KDEP's soil sampling results and compared them to EPA Region 3 soil standards. They found that only one sample that had been collected from between 3.5 and 4 feet below ground surface exceeded EPA Region 3's standards for PCBs and lead. Based on this review of the results and the subsurface depth of the contaminated sample, the PRPs concluded that there was no threat for direct contact with surface soil at the Site. Around the same time, EPA also reviewed the KDEP soil data, but found that the data are too limited to support any conclusions about the effect of site soils on human health or the environment. Consequently, EPA concluded that the presence of these contaminants in subsurface soils indicated a need to restrict excavation and construction on some areas of the Site.

5.5 Institutional Controls

Because PRP and EPA review of the KDEP sampling data indicated some residual subsurface soil contamination, the second FYR recommended that the PRPs review the covenants currently in place and ensure that they restrict excavation and construction activities at the Site. A review in 2003 of the deed documents associated with the Site indicated that despite numerous agreements, easements, and covenants between the PRPs and property owners affected by the Site, no ICs restricting use of the spring water were found. The current covenants grant access to the Site, settle the lawsuit that had been pending against the PRPs, and establish cooperation agreements in which the Site's owners and neighbors agree to allow monitoring and sampling on their properties and to cooperate with the implementation of ICs. The second FYR referenced ICs for restrictions on the use of ground water, but to date formal ICs have not been put in place to accomplish these restrictions. Prevention of the use of spring water as drinking water was accomplished through dismantling of the residents' pump and piping systems, provision of an alternate drinking water source that is more reliable and safer than their previous drinking water source, and verbal agreements with the landowners regarding the nature of the contamination and the effects of consuming the spring water. Similarly, for land use restrictions, verbal agreements have been made, but no formal ICs are in place. However, the selected remedy in the 1991 ROD did not require land use restrictions at the Site.

During the site visit for the previous FYR, participants noted construction activities at the Site and the inspection team spoke with the Cox family about its plans to build an additional residence on the west side of the goat pasture. The inspection team informed the Cox family that this construction was inadvisable given KDEP's sampling results and the fact that the area near the pasture would have been used as a residential yard. Construction on this project was halted and has not been resumed. The site inspection participants discussed whether restrictions, additional remediation, or both, may be necessary prior to construction of an additional residence on the Cox property, and whether precautions such as requiring the slab to be on grade, installation of a vapor barrier, or prohibiting a basement may be necessary.

The site inspection team for the current FYR also noted construction activities underway at the Site; the frame for a barn-like structure had been erected south of the goat pasture near the treatment building. As discussed in Section 5.4, review of KDEP's soil sampling results indicates that unacceptable risks from lead and PCBs may be associated with human exposure to the subsurface soil in these locations, and these activities underscore the need to put formal land and ground water use restrictions in place as soon as possible for all of the properties affected by contamination at the Site. Site visit participants discussed possible ICs for the Site, indicating that the ground water use restrictions would likely apply to all site properties, while it was likely that only the pasture area and the area around the Cox residences would require both land and ground water use restrictions. In the fall of 2007, the PRPs contracted the Kentucky law firm of Conliffe, Sandmann, and Sullivan to draft formal ICs on land and ground water use at the Site. Design of the ICs is underway.

5.6 Warning Signs

The second FYR recommended in April 2003 that the PRPs install signs around the Site to warn residents against excavation and construction on and near the Site. In December 2003, the PRPs undertook a survey of existing use restrictions on site properties and found that no ICs were in place. As a result of this survey, signs were selected as an interim measure to help restrict land use on site until formal ICs could be implemented. In the fourth quarterly report for 2003, an item was added to the work schedule to post signs around the Site to warn residents against excavation and building construction close to the Site. This item was included in the work schedule in each of the subsequent quarterly reports. No warning signs against excavation and construction on and near the Site were evident during the site inspection for the current FYR. Subsequently, warning signs against excavation and construction on and near the Site were developed and installed in 2008.

6.0 Five-Year Review Process

6.1 Administrative Components

EPA Region 4 initiated this Five-Year Review in October 2007 and scheduled its completion for April 2008. The EPA Tri-City Disposal review team was led by Femi Akindele of EPA, Remedial Project Manager (RPM) for the Site, and also included Wesley Turner of KDEP, Carl Shaw of Earth Tech, and contractor support provided to EPA by E² Inc. In October 2007, EPA held a scoping call with the review team to discuss the Site and items of interest as they relate to the protectiveness of the remedy currently in place. The RPM established a review schedule that consisted of the following:

- Community notification;
- Document review;
- Data collection and review;
- Site inspection;
- Local interviews; and
- Report development and review.

6.2 Community Notification and Involvement

On October 31, 2007, a public notice was published in Shepherdsville's *Pioneer News*, announcing the commencement of the FYR process for the Tri-City Disposal Site, providing the RPM's contact information, and inviting community participation. The press notice is available in Appendix B. The FYR report will be made available to the public once it has been finalized. Copies of this document will be placed in the designated public repository: the Ridgeway Memorial Library 127 Walnut St. Shepherdsville, Kentucky, 40165. On November 15, 2007, as part of the site inspection, E² Inc. staff visited the Ridgeway Memorial Library and confirmed that Tri-City Disposal Site documents were readily available to the public in the library's reference room. Upon completion of the FYR, a public notice will be placed in the *Pioneer News* to announce the availability of the final FYR report in the site document repository. The only citizen comments or concerns regarding cleanup activities at the Site that have been received from the public to date are the comments provided to EPA during the public comment review period for the OU1 proposed plan. All comments received by EPA during this period were addressed in the Responsiveness Summary section of the OU1 ROD.

6.3 Document Review

This FYR included a review of relevant, site-related documents including the ROD, remedial action reports, and recent monitoring data. A complete list of the documents reviewed can be found in Appendix A.

ARARs Review

Section 121 (d)(2)(A) of CERCLA specifies that Superfund remedial actions must meet any federal standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate requirements (ARARs). ARARs are identified in RODs and are determined during the RI/FS and at other stages in the remedy selection process. ARARs are those standards, criteria or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA Site. To-Be-Considered criteria (TBCs) are non-promulgated advisories and guidance that are not legally binding, but should be considered in determining the necessary level of cleanup for protection of human health or the environment. While TBCs do not have the status of ARARS, EPA's approach to determining if a remedial action is protective of human health and the environment involves consideration of TBCs along with ARARs.

Location-specific ARARs are restrictions placed on the concentration of hazardous substances or the conduct of activities solely on the basis of location (e.g., wetlands). Action-specific ARARs are technology or activity based requirements or limitations on actions taken with respect to hazardous wastes. These requirements are triggered by the particular remedial activities that are selected to accomplish a remedy. Chemical-specific ARARs are specific numerical quantity restrictions on individually listed contaminants in specific media. Examples of chemical-specific ARARs include the MCLs specified under the Safe Drinking Water Act as well as the ambient water quality criteria that are enumerated under the Clean Water Act. Because there are usually numerous contaminants of potential concern for any Site, various numerical quantity requirements can be ARARs. The final remedy selected for this Site was designed to meet or exceed all chemical-specific ARARs and meet location- and action-specific ARARs, which were identified in the 1991 ROD. Restoration of the spring water should be achieved through treatment with carbon filters and natural air stripping. The NCP requires that state ARARs be met if they are more stringent than federal requirements. ARARs that are identified in the ROD for soil and ground water at this Site are considered for this FYR and listed in the tables below. Under the NCP, EPA's goal is to reduce the excess lifetime cancer risk to within the range of $1x10^{-4}$ to $1x10^{-6}$ for the expected future land use.

Ground Water ARARs

Based on federal drinking water MCLs (40 CFR 141-143), the selected remedy in the 1991 ROD established chemical-specific ARARs for ten COCs in the ground water. This review confirmed that only one of the MCLs has changed since issuance of the 1991 ROD; this change affects chloroform. In 1991, chloroform had an individual MCL of 100 μg/L. Currently, chloroform is regulated as one of a group of contaminants known as trihalomethanes (THMs). This group includes chloroform, bromodichloromethane, dibromochloromethane, and bromoform. The MCL for total THMs is 80 μg/L, but since chloroform is the only THM identified as a COC for the Site, the MCL for total THMs is presented as the MCL for chloroform. Since ground water and spring monitoring at the site has not detected chloroform in ground water or spring water between 2003 and 2007, the change of the chloroform MCL from 100 to 80 µg/L does not affect the protectiveness of the selected remedy for ground water or spring water.

The table below compares the levels of MCLs and MCLGs that were set at ARARs for ground water (as noted in Section 7.3, 9.0 and in Table 20 of the 1991 ROD), and current levels for these MCLs or MCLGs.

Table 9: Chemical-Specific ARARs for Ground Water from the 1991 ROD, and Current Standards for these ARARs

Contaminants	MCLs (µg/L) as of 1991	ARARs (µg/L) as of 1991[1]	MCLs (µg/L) as of 2008	Current standards for ground water ARARs identified in the 1991 ROD[2]	Are there changes in the standards identified as ARARs in the 1991 ROD?
Chloroform	100	100	80	80	Yes
1,1-Dichloroethene	7	7	7	7	No
Cis-1,2-Dichloroethene[3]	70	70	70	70	No
Trans-1,2-Dichloroethene[3]	100	100	100	100	No
PCE[3]	5	5	5	5	No
Toluene	1,000	1,000	1,000	1,000	No
1,1,1-Trichloroethane	200	200	200	200	No
TCE[3]	5	5	5	5	No
Vinyl Chloride	2	2	2	2	No
Xylenes	10,000	10,000	10,000	10,000	No

1) ARARs as of 1991 are based on Federal standards (MCLs) as cited in Table 20 of the 1991 ROD.
2) The current standards for ground water ARARs identified in the 1991 ROD are based on either current MCLs or MCLGs (40 CFR 141-143), whichever is more stringent. Source for the National Primary and Secondary Drinking Water MCLs is http://www.epa.gov/safewater/contaminants/index.html (accessed on 1/11/2008).
3) Synonyms are used for the following contaminants in federal standards (MCLs): 1,1-Dichloroethylene for 1,1-Dichloroethene; Cis-1,2,-Dichloroethylene for Cis-1,2,-Dichloroethene; Trans-1,2,-Dichloroethylene for Trans-1,2,-Dichloroethene; Tetrachloroethylene for Tetrachloroethene; Trichloroethylene for Trichloroethene.

Surface Water Discharge ARARs

The selected remedy in the 1991 ROD required that effluent from the treatment systems is required to meet NPDES standards that are regulated by the State of Kentucky. There have been no changes to the NPDES discharge requirements for the treated effluent between 1991 and 2008.

Table 10: 1991 and Current Levels for Discharge Requirements Included in the 1991 ROD for Treated Effluent

Contaminants	ARARs - NPDES (µg/L) as of 1991	Current standards for Discharge ARARs identified in the 1991 ROD[1]	Are there changes in the standards identified as ARARs in the 1991 ROD?
Chloroform	15.7	15.7	No
1,1-Dichloroethene[2]	1.85	1.85	No
Cis-1,2-Dichloroethene[2]	1.85	1.85	No
Trans-1,2-Dichloroethene[2]	1.85	1.85	No
PCE[2]	8.85	8.85	No
Toluene	424,000	424,000	No
1,1,1-Trichloroethane	1,300,000	1,300,000	No
TCE[2]	80.7	80.7	No
Vinyl Chloride	525	525	No
Xylenes	No criteria	No criteria	No

1) The current standards for discharge ARARs identified in the 1991 ROD are based on current NPDES standards that are regulated by the State of Kentucky. The source for the most current NPDES standards for the Site is the 2003 Five-Year Review (Table 2).
2) Synonyms are used for the following contaminants: 1,1-Dichloroethylene for 1,1-Dichloroethene; cis-1,2-Dichloroethylene for cis-1,2-Dichloroethene; trans-1,2-Dichloroethylene for trans-1,2-Dichloroethene; Tetrachloroethylene for Tetrachloroethene; Trichloroethylene for Trichloroethene.

Soil ARARs

EPA's 1991 and 1996 RODs noted that the removal action conducted in 1988 sufficiently addressed and removed all soils that contained COC concentrations above levels that are protective of human health and the environment. The 1991 ROD thus did not include a soil remediation component within the selected remedy and did not establish ARARs for the remediation of soil contamination. Since the 1991 ROD did not establish such ARARs, a review of the protectiveness of ARARs for the remediation of soil contamination is not required as part of this FYR.

6.4 Data Review

Ground Water

Annual Long-term Monitoring

According to the long-term monitoring plan for the Site, each location that has not had five consecutive sampling events without an exceedance of the cleanup goals established in the 1991 ROD must be sampled during the sitewide annual sampling event. For the last five years, annual monitoring has occurred in the fall and has included the three springs still undergoing treatment and the two active monitoring wells. The annual monitoring data are presented below for 2003 through 2007.

In this table, a blank cell indicates that results from that sample did not exceed cleanup goals established in the 1991 ROD or were below the reporting limit. All data are presented in µg/L.

Table 11: Summary of Long-Term Ground Water Sampling Results for Tri-City Disposal Co.

Annual Sampling from January 2003 to December 2007						
Contaminants	**Ground water cleanup goals from 1991 ROD**	**2003**				
	MCL/MCLG	**Cox**	**Klapper**	**Unnamed #1**	**MW-02**	**MW-04**
Chloroform	100					
1,1-Dichloroethene	7					
Cis-1,2-Dichloroethene	70					
Trans-1,2-Dichloroethene	100					
PCE	5	190	6.5	8.6	67	
Toluene	1,000					
1,1,1-Trichloroethane	200					
TCE	5	13				
Vinyl Chloride	2					
Xylenes	10,000					

Contaminants	Ground water cleanup goals from 1991 ROD	2004				
	MCL/MCLG	Cox	Klapper	Unnamed #1	MW-02	MW-04
Chloroform	100					
1,1-Dichloroethene	7					
Cis-1,2-Dichloroethene	70					
Trans-1,2-Dichloroethene	100					
PCE	5	110		8.3	46	
Toluene	1,000					
1,1,1-Trichloroethane	200					
TCE	5	20				
Vinyl Chloride	2					
Xylenes	10,000					
Contaminants	**Ground water cleanup goals from 1991 ROD**	**2005**				
	MCL/MCLG	**Cox**	**Klapper**	**Unnamed #1**	**MW-02**	**MW-04**
Chloroform	100					
1,1-Dichloroethene	7					
Cis-1,2-Dichloroethene	70					
Trans-1,2-Dichloroethene	100					
PCE	5	200		13	60	
Toluene	1,000					
1,1,1-Trichloroethane	200					
TCE	5	18				
Vinyl Chloride	2					
Xylenes	10,000					

Contaminants	Ground water cleanup goals from 1991 ROD	2006				
	MCL/MCLG	Cox	Klapper	Unnamed #1	MW-02	MW-04
Chloroform	100					
1,1-Dichloroethene	7					
Cis-1,2-Dichloroethene	70					
Trans-1,2-Dichloroethene	100					
PCE	5	220	18	10	67	6.6
Toluene	1,000					
1,1,1-Trichloroethane	200					
TCE	5	8				
Vinyl Chloride	2					
Xylenes	10,000					
Contaminants	**Ground water cleanup goals from 1991 ROD**	**2007**				
	MCL/MCLG	**Cox**	**Klapper**	**Unnamed #1**	**MW-02**	**MW-04**
Chloroform	100					
1,1-Dichloroethene	7					
Cis-1,2-Dichloroethene	70					
Trans-1,2-Dichloroethene	100					
PCE	5	140		10	42	
Toluene	1,000					
1,1,1-Trichloroethane	200					
TCE	5	20				
Vinyl Chloride	2					
Xylenes	10,000					

In summary, the Cox Spring had the highest PCE exceedances over the MCLs/MCLGs that were established as cleanup goals for ground water in the 1991 ROD. In addition, the Cox Spring was the only monitoring location that had an exceedance for a contaminant other than PCE (i.e., TCE). The other monitoring locations had exceedances of PCE, though not at levels as high as those reported at the Cox Spring. PCE concentrations in the Cox Spring are routinely 20 to 40 times the cleanup goals. PCE exceedances in the other springs are not as high but occur fairly regularly. None of the three springs or active monitoring wells is eligible to discontinue their long-term monitoring, as each of these has had exceedances in the last five years.

The table below summarizes how many monitored locations (of Cox Spring, Klapper Spring, Unnamed Spring No. 1, MW-02, and MW-04) exceeded the cleanup goals established in the 1991 ROD for a given contaminant in a given year. A one in the table below indicates that one of these locations exceeded the MCLs/MCLGs that were established as cleanup goals for ground water in the 1991 ROD for that contaminant in that year. If there is a one, it was always the Cox Spring that exceeded the cleanup goal. If the number is greater than one, then the Cox Spring and one or more additional locations also exceeded the cleanup goal for that year and COC.

Table 12: Number of Locations with Any Monitoring Exceedances of Ground Water Cleanup Goals Identified in Table 20 of the 1991 ROD

		Exceedances during the Following Monitoring Years				
Contaminant	**MCL/ MCLG**	**2003**	**2004**	**2005**	**2006**	**2007**
Chloroform	100					
1,1-Dichloroethene	7					
Cis-1,2-Dichloroethene	70					
Trans-1,2-Dichloroethene	100					
PCE	5	4	3	3	5	3
Toluene	1,000					
1,1,1-Trichloroethane	200					
TCE	5	1	1	1	1	1
Vinyl Chloride	2					
Xylenes	10,000					

The following table presents the highest exceedances reported for the Cox Spring in each year for which there are annual data.

Table 13: Summary of Highest Ground Water Monitoring Exceedances of MCLs/MCLGs that were Established as Cleanup Goals for Ground Water in the 1991 ROD Per Year (from Cox Spring)

Contaminant	MCL/MCLG	2003	2004	2005	2006	2007
PCE	5	190	110	200	220	140
TCE	5	13	20	18	8	20

Over the previous five years, the monitoring locations have maintained similar patterns of exceedances of cleanup goals established in the 1991 ROD, in terms of the contaminants, concentrations, and frequency of these exceedances. There has been some fluctuation, but there does not appear to be a significant trend towards either decreasing or increasing concentrations.

Monthly Effluent Monitoring

As established in Section 7.3 and Section 9 (#5) of the 1991 ROD, the site's treated effluent ARARs are the NPDES discharge levels.

Monthly monitoring of the treatment system effluent from each of the three springs is required in the O&M Plan. The results of this monitoring reflect the effectiveness of the ground water treatment systems. The following table presents the sampling results from the monthly monitoring of treatment system effluent for the three on-site springs. The only COCs with exceedances above effluent discharge requirements as noted in Table 10 are TCE, PCE, and cis-1,2-DCE. Any exceedances above the NPDES discharge requirements noted in Table 10 are presented in the table below.

Since each spring's effluent should be monitored monthly, there should be three samples per spring per quarter. If any of the samples for a given spring in a given quarter has an exceedance, that information is recorded in the table. If a given contaminant was detected above a standard more than once in the same spring and the same quarter, only the highest concentration is listed.

The table below summarizes the majority outcome for quarterly sampling of each spring's effluent. Therefore, if there were no exceedances among the samples collected, and two or three samples were collected, then the table shows ND for Non Detect. If there were no exceedances among the samples collected, and zero or one sample was collected, then the table shows NS for Not Sampled because the majority of the three samples that were supposed to be collected for that spring's effluent in that quarter were not collected.

There are several reasons why a spring's effluent may not have been sampled in a given month or quarter. Some samples were not collected because the treatment system was non-operational and in need of repair. Some samples were not collected due to dry conditions at the Site and a lack of sufficient water in the spring's effluent to allow sampling. Sometimes the sample was collected, but was lost by the previous O&M contractor and therefore no data were obtained from the sample. In each of these three circumstances, the samples are labeled NS for Not Sampled.

Table 14: Quarterly Sampling Results of Treatment System Effluent

	Cox	Klapper	Unnamed #1
2003			
1st Quarter	cis-1,2-DCE: 3.1 µg/L	PCE: 14 µg/L	ND
2nd Quarter	cis-1,2-DCE: 4.1 µg/L	ND	ND
3rd Quarter	ND	ND	ND
4th Quarter	NS	NS	ND

	Cox	Klapper	Unnamed #1
2004			
1st Quarter	ND	ND	ND
2nd Quarter	NS	ND	NS
3rd Quarter	NS	NS	NS
4th Quarter	NS	ND	ND
2005			
1st Quarter	cis-1,2-DCE:120 μg/L PCE: 85 μg/L	ND	ND
2nd Quarter	ND	ND	ND
3rd Quarter	ND	NS	ND
4th Quarter	ND	ND	ND
2006			
1st Quarter	ND	ND	PCE: 13 μg/L
2nd Quarter	cis-1,2-DCE: 5.5 μg/L	ND	ND
3rd Quarter	cis-1,2-DCE: 9.7 μg/L PCE: 15 μg/L	ND	ND
4th Quarter	cis-1,2-DCE: 7.6 μg/L	PCE: 9.5 μg/L	ND
2007			
1st Quarter	cis-1,2-DCE:13 μg/L PCE: 77 μg/L	ND	ND
2nd Quarter	ND	ND	ND
3rd Quarter	NS	NS	ND
4th Quarter	ND	ND	ND

This table shows that effluent from the Cox Spring most frequently exceeded the NPDES discharge requirements for PCE and cis-1,2-DCE. The effluent from Klapper Spring has regular exceedances of NPDES discharge requirements for PCE, while the effluent from Unnamed Spring No. 1 has less frequent exceedances of PCE.

Almost a fifth of the monthly monitoring samples that could have been collected under the O&M Plan for the Site were not collected. This was due in large part to the regional drought, which resulted in insufficient flow in the effluent from the springs to allow sampling. Almost equally responsible for the missing samples were electrical problems with the treatment systems that rendered the treatment systems non-operational for one to three months at a time, resulting in the absence of effluent for sampling. In addition, six samples were collected, but lost by the previous O&M contractor. However, no samples have been lost since AEGL has taken over responsibilities for the monthly sampling. Less than a quarter of all the samples analyzed had exceedances of some kind, while the majority of the samples analyzed did not have exceedances. Especially in 2007, sampling results for those months with sufficient water for sampling had a decreased incidence of exceedances.

Soil

EPA's 1991 and 1996 RODs noted that the removal action conducted in 1988 sufficiently addressed and removed all soils that contained levels of COCs above those that are protective of human health and the environment. The 1991 ROD thus did not include a soil remediation component within the selected remedy and did not establish ARARs or cleanup goals for the remediation of soil contamination. However, because there is persistent soil contamination at the Site, as reported in the second FYR, soil standards developed by EPA Regions 3 and 4 for use at Superfund sites were reviewed during this FYR to assess the protectiveness of current concentrations of COCs within residual soils at the Tri-City site.

The soil samples collected by KDEP in 2001 and 2002 were evaluated by the PRPs in December 2003. These samples were analyzed for dioxin, furans, PCBs, and metals; the samples were not analyzed for site COCs. At EPA's request, the PRPs compared KDEP's results to the risk-based concentration (RBC) tables developed by EPA Region 3. Based on this comparison, the PRPs determined that only one subsurface sample (TC5-D) exceeded the EPA Region 3 RBCs. This subsurface sample was collected at a depth of 3.5 to 4 feet below ground surface on property owned by Mr. Cox Sr., near the southwest corner of the fence that encloses Mr. Hoosier's goat pasture. The contaminants that exceeded EPA Region 3 RBCs were PCBs (combined aroclors = 3.6 mg/kg) and lead (1430 mg/kg). Based on this review of the results, the PRPs concluded that there was no threat for direct contact with surface soil at the Site.

The 2007 EPA Region 3 and 4 standards and 2002 KDEP metal and PCB results are presented in the table below. EPA Region 4 standards are more stringent than current EPA Region 3 standards for chromium, cadmium, barium, less stringent than EPA Region 3 standards for copper and combined aroclors (e.g., aroclor 1254), and equal to current EPA Region 3 standards for lead. These comparisons are based on a Dilution Attenuation Factor (DAF) of one. Both Regions provide standards for DAF 1 and DAF 20, but since the contaminants for this Site are analyzed using DAF 1, this standard was selected for the analysis. The highest concentrations for each contaminant detected during the 2002 KDEP metals and PCB analyses are presented in the table below. Only lead and PCBs (i.e., total aroclors) exceed either Region 3 or Region 4 standards; this result is consistent with the findings of the PRP data review that were based on comparison with 2003 EPA Region 3 standards. In addition to the lead and PCB concentrations detected in sample TC5-D, which was collected between 3.5 and 4 feet below ground surface, two other samples (TC1-D and TC2-D) contained PCB concentrations that are greater than the 2007 EPA Region 4 standards for combined aroclors. These samples were collected just outside the fence that runs along the eastern side of the goat pasture at a depth between six inches and one foot below ground surface.

Although the soil samples collected by KDEP do not provide evidence of surface soil contamination, some subsurface samples contain lead and PCB concentrations that exceed EPA Region 3 and 4 soil standards. Concerns about this subsurface soil contamination have prompted EPA to consider possible ICs to restrict excavation and construction on affected areas of the Site.

Table 15: Comparison of EPA Region 4's PRGs and SSLs, EPA Region 3's 2007 RBCs and SSLs, and KDEP's 2002 Soil Sampling Results

	EPA Region 4		EPA Region 3		KDEP's 2002 soil sampling results[5]
Contaminants	PRGs (mg/kg)[1]	SSLs – DAF 1 (mg/kg)[1,2]	RBCs (mg/kg)[3]	SSLs – DAF 1 (mg/kg)[2,3]	
Lead	400	No criteria	No criteria	400[5]	1,430
Barium	5,400	82	16,000	300	2,470
Cadmium	37	0.4	39	1.4	11.3
Chromium	210	2	230	2.1	200
Copper	3,100	No criteria	3,100	530	94.1
Combined Aroclors[4]	0.22	No criteria	0.32	0.054	3.6

1) The Commonwealth of Kentucky and EPA Region 4 use the PRGs published by EPA Region 9; see http://www.epa.gov/region4/waste/ots/healtbul.htm. Region 9's PRGs and SSLs used in this table were published in 2004, which can be obtained from http://www.epa.gov/region09/waste/sfund/prg/files/04prgtable.pdf (accessed on 1/17/2008). Soil PRGs are based on the assumption of direct contact exposure pathway in a residential setting, and SSLs are based on the assumption of soil contaminants migrating into ground water.
2) The SSLs for DAF 1 assume no dilution or attenuation between the source and the receptor well. These values can be used at sites where little or no dilution or attenuation of soil leachate concentrations is expected (e.g., sites with shallow water tables, fractured media, karst topography, or source size greater than 30 acres). See Region 9's PRG Table User Guide http://www.epa.gov/region09/waste/sfund/prg/files/04usersguide.pdf for details on these different SSLs (accessed on 1/17/2008). EPA Region 3 SSLs are calculated using the same DAFs as Region 9 SSLs.
3) RBCs and SSLs are based on EPA Region 3's RBC table published in 2007, which can be obtained from http://www.epa.gov/reg3hwmd/risk/human/rbc/RBCoct07.pdf (accessed on 1/22/2008). Soil RBCs are based on the assumption of direct contact exposure pathway in a residential setting, and SSLs are based on the assumption of soil contaminants migrating into ground water.
4) Aroclors at the Site are high-risk mixture of PCBs such as Aroclor 1254. Therefore, the SSLs listed here are lower than the low-risk mixture of PCBs such as Aroclor 1016.
5) This column presents the highest concentration of each contaminant that was detected in the 2002 KDEP soil samples.

6.5 Site Inspection

The site inspection for the Tri-City Disposal Site occurred on November 14, 2007 and included Carl Shaw of Earth Tech, Wesley Turner and Kenneth Logsdon of KDEP, and Amanda Knoff and Cara Forster of E^2 Inc. The purpose of the inspection was to assess the condition of the remedy, document site conditions through photographs, and confirm that O&M was occurring as required. The complete site inspection checklist is included in Appendix D. Also as part of the site inspection, E^2 Inc. staff conducted research at the Bullitt County Public Records office and visited the Site's information repository.

<u>Treatment Building</u>

The site inspection started at the locked treatment building, which houses drums of spent carbon and GAC drums used to treat the water from the Cox Spring and Unnamed Spring No. 1. Mr. Shaw explained that carbon canisters are purchased once a year and changed when necessary by the local contractor, and that the spent carbon drums are removed when new ones are delivered. The treatment building houses the equipment that pumps water out of Unnamed Spring No. 1 and the Cox Spring, through the carbon filters, and back into the springs. The control systems in the pump house are automatic and have surge protection installed to protect the system from power outages, which are common in this area. The treatment system reported an error message during the site inspection and Mr. Shaw explained that these messages are relayed to the local contractor, AEGL, in charge of the treatment system maintenance.

<u>Goat Pasture</u>

The participants then inspected the goat pasture north of the treatment building and the ravine in which Unnamed Spring No. 1 is located. Mr. Lodgson explained that KDEP took soil samples in and around the goat pasture and the nearby residences in 2000 using hand augers. Because of the nature of the hand augers, the samples were collected from between six inches and four feet of depth, but deeper samples could not be collected. Around the houses, the KDEP samples did not have any exceedances of EPA Region 3 standards, but in and around the goat pasture, the KDEP samples had exceedances for lead and PCBs. Mr. Logsdon recalled that the KDEP samples contained PCBs at between six inches and four feet of depth from the area approximately even with the satellite dishes, east across the goat pasture, and south to the pasture's gate. However, since KDEP's soil sampling was limited in scope, the exact extent of the contamination remains uncertain. KDEP does not plan to require additional clean fill for the goat pasture given its current use. Mr. Logsdon explained that KDEP has recommended that samples be taken from greater depths to define more precisely the extent of remaining contamination and to support any land use restrictions. He explained that part of the goat pasture still has contaminated soils, and ICs should therefore include restrictions on both construction/excavation and residential use.

Unnamed Spring No. 1

While hiking down the ravine to Unnamed Spring No. 1, the participants saw many rusted out drums, large quantities of fiberglass insulation, and significant amounts of discarded rubbish (including tires, appliances, and a vehicle). Mr. Shaw explained that the debris in the ravine was from two sources: some had weathered out of the soil in the hillside where waste disposal activities took place and some had been dumped down the ravine more recently. He said that the drums now visible had weathered out of the ravine and had not been visible during the previous FYR. At the bottom of the ravine, Unnamed Spring No. 1 meets Unnamed Spring No. 2, which was dry at the time of the site visit. The pump system for Unnamed Spring No. 1 was in good condition and seemed to be working properly, though flow in the spring was minimal. One of the rusted drums that had weathered out of the hillside was lying in close proximity to the pump system.

Cox Spring

The original collection system at the Cox Spring relied on a brick dam to collect the water and a pump system to take it to the house. The remedial pump system makes use of the original dam to collect water that is then pumped to the treatment shed for filtration. After the treatment system was in place, Mr. Cox dug a pond on his property in the summer of 2000 and accidentally cut the controller line that controls the pump at the Cox Spring. The electrical line that powers the pump and the water lines that convey the water were not cut during the excavation. Once this problem was discovered, the PRPs decided to install a float switch for the pump at the Cox Spring to avoid the disruptions that would be associated with laying a new electrical line. One consequence of the float switch is that the Cox Spring cannot be monitored from the treatment building, but rather must be visited in person. This does not pose a problem, as the spring is easily accessible from the road. During the site inspection, the Cox Spring had only a small amount of water entering the holding tank and being pumped to the treatment building and the pump system appeared to be functioning properly.

Klapper Spring

Mr. Shaw explained that Mrs. Klapper Sr. lives in the white house past the Cox Spring. Her house has an extensive vegetable garden and her son and his family own the house next door. Behind the Klapper residences lies the Klapper Spring, which still experiences occasional detections of PCE above the 5 μg/L limit. Fifty feet downstream from the source of the spring, the water is typically below cleanup goals established in the 1991 ROD, which is why the PRPs fenced the first 50 feet of the stream, to prevent direct contact with the contaminated water. Flow down the streambed acts as a kind of natural air stripping process that removes VOC contamination from the spring water. While the participants were inspecting the Klapper Spring, Mr. Shaw mentioned that higher contaminant concentrations have in general been detected in the springs during the winter months. The fence around the Klapper Spring was intact, topped with barbed wire, and the gate was locked. Mr. Shaw elaborated that this year has been a very dry summer and fall, that the Klapper Spring has been dry all summer, and that the Cox Spring dried up for the first time in the Site's history this summer due to the regional drought. Dry seasons mean that often there is barely enough water to pump and filter or remove for sampling purposes.

Monitoring Wells

There are two monitoring wells still in operation: one is between the Cox Sr. residence and the goat pasture and the other is in the goat pasture. These wells are sunk into massive concrete surface casings, and covered with protective metal lids. Monitoring well MW-02 is 51 feet deep and MW-04 is 60 feet deep. These two remaining monitoring wells continue to be sampled, as they have not had five consecutive years of data without an exceedance. There are no useful ground water aquifers in the vicinity of the Site and Mr. Shaw explained that many dry wells were dug to obtain the original six functioning monitoring wells. This is the reason why the residents previously relied on spring water for drinking water rather than on ground water wells.

Institutional Controls

KDEP expressed the desire not to implement overly restrictive covenants on the site properties. However, KDEP would like the ICs to be protective and therefore advocates more extensive sampling in order to clearly define the extent of the remaining soil contamination. Mr. Logsdon recommended that the ICs include provisions for maintaining the cover of clean fill in the pasture, but not necessarily adding to the clean fill at this time. Mr. Turner suggested that the easements surrounding the utility poles on the western edge of the pasture already limit construction within a certain number of feet from the poles, and that ICs could extend these restrictions. KDEP did not express any current issues regarding the Site's ground water remedy. Mr. Shaw explained that the PRPs' Focused Risk Assessment demonstrates that while the levels of contamination are not below MCLs, they do not represent a risk to human health. At that time, EPA was reviewing the Focused Risk Assessment to determine whether or not the Agency could concur with this conclusion. Mr. Shaw explained that since the spring water is not used as a source of drinking water, the main pathways of concern are direct contact and inhalation. The restrictive covenants discussed for the Site would contain restrictions on the use of spring water or ground water as a drinking water source. All the families near the Site have been connected to public water mains and no longer use the springs as sources of drinking water. Mr. Shaw concurred that there are no formal ICs currently in place. Participants agreed that only ground water use restrictions would be required for the surrounding properties and that the only area that will need both soil and ground water restrictions is the goat pasture. The PRPs have contracted the law office of Conliffe, Sandmann, and Sullivan to design ICs for this Site. EPA, state, and PRP attorneys are currently working together to design the ICs.

As part of the site inspection, E^2 Inc. staff visited the Bullitt County public records office on November 15, 2007 and researched the history of property transfer and restrictions on the properties affected by the Site. The CERCLIS address for the Tri-City Disposal Site is "Route 1526 at the Gravel Road" in Shepherdsville, Kentucky. The deed documents available at the public records office list street addresses for the three primary property owners involved with the Site, which are located on Klapper Road in Brooks, Kentucky. While there are covenants and easements in place granting access to these properties for monitoring and sampling, there are no specific ground water use restrictions currently in place. The relevant deed documents acquired by E² Inc. during this FYR will be forwarded to EPA for review and use as needed.

6.6 Interviews

During the Five-Year Review process, interviews were conducted with the current landowners, surrounding property owners, and regulatory agencies involved with the Site. The purpose of the interviews was to document the perceived status of the Site and any perceived problems or successes with the phases of the remedy that have been implemented to date.

Community interviews were conducted by telephone and all individuals interviewed were notified of the FYR process and that the final report would be placed in the Site's information repository in the Ridgeway Memorial Library (127 N. Walnut Street, Shepherdsville, Kentucky 40165). The Site's Community Involvement Coordinator (CIC), Angela Miller, conducted all of the interviews in February 2008. The interviews are summarized below and the CIC's complete summary is included in Appendix C.

Most of the citizens that resided near the Site during the cleanup are now deceased or living in nursing homes. The residents interviewed were not pleased during the cleanup or with the results of the cleanup. All of the interviewed residents stated that they wished the Site had been cleaned up better. Resident concerns centered on drums that are still partially buried on the Site as well as insulation that is still visible all around the Site. Some residents expressed the opinion that everyone near the Site should have been bought out, while others are requesting that their properties be sampled again.

The residents also had several concerns about site maintenance issues, including: the Site's appearance as an eyesore in their community, having to pay out of pocket to repair yards damaged during installation of the monitoring wells, monitoring wells that are not flush to the ground and are therefore difficult to work around, and removal of the steel tanks that were placed on residential properties as part of the treatment system. City of Shepherdsville officials stated that they have not received any calls, complaints, or concerns about the Site.

In summary, the residents interviewed wish that the Site had been cleaned up better and many expressed concerns about site maintenance. Nevertheless, these concerns do not indicate that the site remedy is not functioning as designed.

7.0 Technical Assessment

7.1 Question A: Is the remedy functioning as intended by the decision documents?

The review of documents, ARARs, risk assumptions, and the site inspection indicate that the engineering controls and remedial components currently in place are generally functioning as intended by the ROD, but that formal ICs have not been put in place. In addition, continued exceedances of ground water cleanup goals are evident in the spring water and there has not been an apparent reduction in PCE and TCE concentrations over the last five years, especially in the Cox Spring.

Institutional Controls

The ROD intended for ICs to be in place to restrict the use of springs as potable water sources and intended these restrictions to continue until monitoring indicates that water in the springs meets cleanup goals established in the 1991 ROD. This portion of the remedy also required a provision of an alternate drinking water source for affected families. The portion of the remedy covering provision of an alternative drinking water supply is functioning as intended because both the Cox and Klapper residences were provided with bottled water until they were connected to the public water supply. However, no ICs restricting the water usage are formally in place at this time. Attorneys for the PRPs, EPA, and the state are currently designing the Site's ICs.

Long-term Monitoring

The long-term monitoring of springs, wells, and treatment system influent and effluent is functioning as intended by the ROD. Monitoring of the springs and active wells has been occurring annually as specified by the ROD. This has been effective in creating a history of data that allows site staff to determine when the samples from each source no longer exceed federal standards as contained in the cleanup goals established in the 1991 ROD. This has also created a history of data that shows an overall decline in VOC concentrations in the springs over the long-term. Although there is an overall decline in VOC concentrations over the long-term, there are still exceedances of the MCLs. The graphs presenting this data can be found in Appendix F. The ROD specifies that the sampling results will be reviewed every five years for possible alterations in the monitoring program.

Confirmatory Sampling

The confirmatory sampling required by the OU1 ROD was concluded in 1993. This sampling confirmed that the Site was not a threat to the ecology of Brushy Fork Creek, and identified the need to continue the treatment of the Cox Spring, Unnamed Spring No. 1, and the Klapper Spring.

Treatment with Carbon Adsorption

Treatment of the Cox Spring, Unnamed Spring No. 1, and the Klapper Spring is ongoing. Cox Spring and Unnamed Spring No. 1 continue to receive treatment through pumping and treatment with carbon filters. Monitoring shows that treatment is largely effective in removing VOCs from the water. Monthly sampling of the treatment system effluent does result in regular MCL exceedances, but these exceedances are much lower than those found in the influent samples; this indicates the effectiveness of treatment in reducing VOC contamination in the springs.

Nevertheless, the last five years of data do not show a declining trend in the concentration of VOCs in the springs. Treatment is largely effective at removing the existing contamination, but not at eliminating the source of contamination or eliminating the need for treatment.

As indicated in Tables 11, 12, and 13, when the sampling data collected since 2003 are compared to ground water cleanup goals indicated in the 1991 ROD, continued exceedances of cleanup goals for TCE and PCE are evident in the spring water without an apparent reduction in ground water concentrations over time, especially in the Cox Spring. Toxicity data and cleanup levels established in the 1991 ROD for spring water at the Site remain valid. Remediation of VOCs in the affected springs is progressing more slowly than expected. The 1991 ROD stated that levels of VOCs in the Cox Spring were expected to decrease to near or below MCLs within ten years. The remedy has been in progress since 1996, and the levels of TCE and PCE in the Cox Spring remain above the MCLs. While declines in VOC concentrations are noticeable over the 17 years between the Site's two Risk Assessments, declines in concentrations of DCE, TCE and PCE are not noticeable in site ground water or in spring water since 2003.

7.2 Question B: Are the exposure assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives (RAOs) Used at the Time of Remedy Selection Still Valid?

There have been no significant changes to the standards and assumptions used for the Site since the time of remedy selection that affect protectiveness at the site. The exposure assumptions used in the original Risk Assessment differed from those used in the new Focused Risk Assessment mainly in that the Focused Risk Assessment no longer considered the use of spring water for domestic purposes as an exposure pathway, because such uses are currently not occurring and will be controlled through ICs when those ICs are formally put in place.

Tables 9 and 10 indicate the standards used as ARARs and cleanup goals for the ground water, and NPDES requirements for discharge of treated effluent at the Site, in 1991 at the time of signature of the ROD, and in 2007. The only change in levels between 1991 and 2007 is the ground water cleanup goal for Trihalomethanes, including chloroform, which changed from 100 to 80 μg/L. Since ground water and spring monitoring at the site has not detected chloroform in ground water or spring water between 2003 and 2007, the change of the chloroform MCL from 100 to 80 µg/L does not affect the protectiveness of the selected remedy for ground water or spring water.

Current land use for the Site and surrounding properties is residential and agricultural, and future use of the Site is expected to be similar. Given the Cox family's interest in constructing another home on their property and the presence of subsurface soil contamination, ICs may be necessary to manage any additional construction at the Site, and residents should contact both EPA and the state prior to undertaking any construction or excavation activities. Since the 1991 ROD did not include standards for soil contaminants, the risk-based concentration levels developed by EPA Region 3 and EPA Region 4 are presented as soil ARARs and used to assess the state's soil sampling results and possible remaining soil contamination at the Site.

The confirmatory sampling conducted as part of the OU1 remedy indicated residual VOC contamination in subsurface soils. Although this contamination was not considered a threat to human health or the environment at the time of the 1996 No Action ROD, VOC concentrations in some ground water and spring water monitoring locations have not reached cleanup goals within the originally anticipated timeframe. This may indicate that the remaining subsurface VOC soil contamination is a continuing source of VOCs to the ground water. As a result, a leachability study may be necessary to evaluate this potential source of ground water contamination. In addition, persistent VOC concentrations in subsurface soils and ground water located underneath the residences on the Site may indicate a need for a screening level vapor intrusion assessment to evaluate whether this potential exposure pathway presents an unacceptable risk to human health.

In addition to residual VOC contamination, lead and PCBs (i.e., total aroclors) exceed Region 3 and Region 4 screening values. In addition to the lead and PCB concentrations detected in sample TC5-D, which was collected between 3.5 and 4 feet below ground surface, two other samples (TC1-D and TC2-D) contained PCB concentrations that are greater than the 2007 EPA Region 4 screening values for combined aroclors. These samples were collected just outside the fence that runs along the eastern side of the goat pasture at a depth between six inches and one foot below ground surface.

7.3 Question C: Has Any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

There is no information, other than what has been discussed above, that calls into question the protectiveness of the remedy.

7.4 Technical Assessment Summary

According to the data reviewed, the site inspection, and the interviews, the remedy is functioning as intended by the ROD, with the exception of formal ICs, which have not yet been implemented, and the persistent contamination in the spring water. The design and implementation of ICs to restrict the use of land and ground water resources at the Site are underway. Available data from the OU1 remedy confirmatory sampling and

KDEP sampling indicate that residual soil contamination is located below ground surface; these data therefore indicate that contact with surface soils does not present an unacceptable risk to human health at the Site. It should be possible through education of the property owners, collaboration with regulatory agencies during construction, and implementation of ICs, to make the desired future use of the property compatible with the Site's remedy and cleanup goals identified in the 1991 ROD. However, the presence of contaminants in soils collected between six inches and one foot below ground surface should be considered, as these depths can be accessed during normal residential activities such as gardening or landscaping.

The VOCs above cleanup goals noted in the 1991 ROD in the Cox Spring and Unnamed Spring No. 1 do not show a decreasing trend over the past five years, though declines are noticeable over the longer term. Because the spring water does not yet meet cleanup goals established in the 1991 ROD, either continued treatment and monitoring or acceptance of the new risk assessment results will be necessary. Similarly, a leachability assessment should be conducted to evaluate whether residual VOC contamination in subsurface soils may be leaching to ground water and preventing site ground water and spring water from meeting cleanup goals within the timeframe originally anticipated in the 1991 ROD. In addition, a screening level vapor intrusion assessment should be conducted to determine whether this potential exposure pathway presents an unacceptable risk to human health. The PRPs reviewed KDEP's recent data indicating a potential subsurface PCB and lead contamination source and concluded that there was no threat from direct human contact with surface soil at the Site. EPA reviewed the data and found that the data were too limited to support any conclusions about the effect of soils on human health or the environment. There is no other information that calls into question the protectiveness of the remedy.

8.0 Issues

Table 16: Current Issues for the Tri-City Disposal Site

Issue	Affects Current Protectiveness	Affects Future Protectiveness
No formal ICs are currently in place to restrict the use of spring water or ground water at the Site.	N	Y
Some subsurface soil contamination has been identified and there is planned construction of a residence adjacent to the cap and actual construction of a barn on the capped portion of the Site.	N	Y
Monitoring data indicate that the contaminant concentrations in ground water are not decreasing as rapidly as predicted in the ROD. This suggests the potential for a continuing source of VOC contamination from the Site's soils to the ground water.	N	Y
A screening level vapor intrusion assessment has not been conducted to determine whether this potential pathway presents an unacceptable risk to human health.	N	Y

9.0 Recommendations and Follow-up Actions

Table 17: Recommendations to Address Current Issues at the Tri-City Disposal Site

Issue	Recommendations/ Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
					Current	Future
No formal ICs are currently in place to restrict the use of spring water or ground water at the Site.	Design and implement ICs for spring water and ground water as soon as possible.	PRPs and EPA	EPA	9/30/09	N	Y
Some subsurface soil contamination has been identified and there is planned construction of a residence adjacent to the cap and actual construction of a barn on the capped portion of the Site.	Implement land use ICs and educate residents on their rights, responsibilities, and the risks associated with subsurface soil contamination left in place. If ICs are pursued to require land use restrictions on excavation and construction, specific soil concentrations should be developed that indicate the threshold concentrations for residual soils that would require IC restrictions. EPA should follow appropriate guidelines for selecting and implementing soil ICs, as there are currently none required in the ROD.	PRPs	EPA	9/30/09	N	Y

Issue	Recommendations/ Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
					Current	Future
Monitoring data indicate that the contaminant concentrations in ground water are not decreasing as rapidly as predicted in the ROD. This suggests the potential for a continuing source of VOC contamination from the Site's soils to the ground water.	Consider conducting additional soil sampling to evaluate whether there is a continuing source of contamination in the Site's soils. Continue to conduct required O&M and long-term monitoring or accept the new PRP Focused Risk Assessment.	PRPs	EPA	9/30/09	N	Y
A screening level vapor intrusion assessment has not been conducted to determine whether this potential pathway presents an unacceptable risk to human health.	Conduct a screening level vapor intrusion assessment, evaluate results, and if results indicate an unacceptable risk, assess and perform remediation to address this risk.	PRP	EPA	12/31/08	N	Y

10.0 Protectiveness Statement

The remedy at the Tri-City Disposal Site currently protects human health and the environment. Exposure pathways that could result in unacceptable risks are being controlled. The assessment carried out for this FYR found that the remedy has been implemented in accordance with the requirements set forth in the Site's 1991 ROD, with the exception of ICs. The remedy is protective of human health and the environment in the short term because of the treatment and monitoring of ground water at the Cox Spring and Unnamed Spring No. 1, access restrictions on the Klapper Spring, provision of families with access to the public water supply, and continued monitoring of VOC contamination at the Site. The surface soils do not appear to be a source of concern, the springs are not being used for drinking water, and the site owners and neighbors are informed about the Site

However, sampling indicates that VOCs persist in the two active monitoring wells and three affected springs. In order for the remedy to be protective in the long term, the contaminated spring water will need to be monitored and treated until it achieves ground water cleanup goals established in the ROD or until the PRPs new Focused Risk Assessment can be used to support that the spring water does not present a threat to human health or the environment. In addition, ICs to restrict use of ground water will need to be implemented and a screening level vapor intrusion assessment will need to be conducted to determine whether this potential pathway presents an unacceptable risk to human health. Soil sampling indicates the presence of residual contamination in subsurface soils. In order to ensure long term protectiveness, the residual subsurface soil contamination should be evaluated and appropriate action should be taken. If ICs are pursued to require land use restrictions on excavation and construction at the Site because there is contamination that does not allow for unlimited use or unrestricted exposure, specific soil concentration levels should be developed to indicate the threshold levels that would require IC restrictions on excavation and construction at the Site. EPA should follow appropriate guidelines for selecting and implementing ICs for soils since there are currently none required in the ROD. Since no remedial action was completed for OU2, the protectiveness statement for OU1 is also the site-wide protectiveness statement.

11.0 Next Review

As established in Section 121 of CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA) and the NCP, periodic reviews are required at least every five years for sites where hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure following the completion of all remedial actions. Barring a change in the governing laws, another review should be completed within five years from the signature date of this document. Since waste is left on site in site ground water and potentially in site soils that does not allow for unrestricted use and unlimited exposure, the next FYR will be due no later than April 2013.

Appendix A: List of Documents Reviewed

"Analytical Report Tri-City Disposal," Annual ground water monitoring data prepared by Severn Trent for Earth Tech. October 6, 2003.

"Analytical Report Tri-City Disposal," Annual ground water monitoring data prepared by Severn Trent for Earth Tech. October 22, 2004.

"Analytical Report Tri-City Disposal," Annual ground water monitoring data prepared by Severn Trent for Earth Tech. October 6, 2005.

"Analytical Report Tri-City Disposal," Annual ground water monitoring data prepared by Severn Trent for Earth Tech. October 16, 2006.

"Analytical Report for Tri-City Disposal," prepared by Severn Trent Laboratories, Inc./STL Denver. May 16, 2007.

"Analytical Report for Tri-City Disposal," prepared by Severn Trent Laboratories, Inc./STL Denver. August 17, 2007.

"Analytical Report for Tri-City Disposal," prepared by Severn Trent Laboratories, Inc./STL Denver. October 11, 2007.

"Analytical Report Tri-City Disposal," Annual ground water monitoring data prepared by TestAmerica for Earth Tech. December 12, 2007.

"Five-Year Review Report: Tri-City Industrial Disposal Superfund Site," prepared by EPA. April 3, 1998.

"Five-Year Review Report: Tri-City Disposal Co.," prepared by EPA Region 4 and Earth Tech Inc. April 29, 2003.

"Focused Risk Assessment of Potential Exposures to Volatile Organic Compounds Detected in Spring Water," prepared by Earth Tech, Inc. January 2008.

"Memorandum on Confirmatory Sampling," prepared by Randall Patchett for Femi Akindele. December 18, 1995.

Mr. Sid Ortho Imagery for Kentucky. Division of Geographic Information. Image numbers: fsa_n23e058 and fsa_n23e057 used for Figures 1 and 2. Frankfort, Kentucky. 2000.

"Quarterly Progress Report No. 89, First Quarter, 2003," prepared by Earth Tech. May 27, 2003.

"Quarterly Progress Report No. 90, Second Quarter, 2003," prepared by Earth Tech. August 6, 2003.

"Quarterly Progress Report No. 91, Third Quarter, 2003," prepared by Earth Tech. December 18, 2003.

"Quarterly Progress Report No. 92, Fourth Quarter, 2003," prepared by Earth Tech. February 27, 2003.

"Quarterly Progress Report No. 93, First Quarter, 2004," prepared by Earth Tech. May 5, 2004.

"Quarterly Progress Report No. 94, Second Quarter, 2004," prepared by Earth Tech. September 10, 2004.

"Quarterly Progress Report No. 95, Third Quarter, 2004," prepared by Earth Tech. December 30, 2004.

"Quarterly Progress Report No. 96, Fourth Quarter, 2004," prepared by Earth Tech. March 21, 2004.

"Quarterly Progress Report No. 97, First Quarter, 2005," prepared by Earth Tech. May 23, 2005.

"Quarterly Progress Report No. 98, Second Quarter, 2005," prepared by Earth Tech. September 16, 2005.

"Quarterly Progress Report No. 99, Third Quarter, 2005," prepared by Earth Tech. October 28, 2005.

"Quarterly Progress Report No. 100, Fourth Quarter, 2005," prepared by Earth Tech. February 2, 2005.

"Quarterly Progress Report No. 101, First Quarter, 2006," prepared by Earth Tech. June 6, 2006.

"Quarterly Progress Report No. 102, Second Quarter, 2006," prepared by Earth Tech. August 15, 2006.

"Quarterly Progress Report No. 103, Third Quarter, 2006," prepared by Earth Tech. October 27, 2006.

"Quarterly Progress Report No. 104, Fourth Quarter, 2006," prepared by Earth Tech. March 16, 2006.

"Quarterly Progress Report No. 105, First Quarter, 2007," prepared by Earth Tech. April 26, 2007.

"Quarterly Progress Report No. 105, First Quarter, 2007," prepared by Earth Tech. April 26, 2007.

"Record of Decision: Tri-City Disposal Co.," prepared by EPA for OU1. EPA/ROD/R04-91/082. August 28, 1991.

"Record of Decision: Tri-City Disposal Co.," prepared by EPA for OU2. EPA/ROD/R04-96/269. March 29, 1996.

StreetMap USA. Baselayer for Figures 1 and 2. USA: ESRI, 2006.

"Tri City Sample Locations: Dioxin/Furan Results," prepared by KDEP. December 2001 and March 2002.

Appendix B: Press Notice

U. S. Environmental Protection Agency, Region 4
Announces a Five-Year Review
for the Tri-City Disposal Company Site,
Shepherdsville, Bullitt County, Kentucky

The U.S. Environmental Protection Agency (EPA) is conducting a Five-Year Review of the remedy for contamination associated with the Tri-City Disposal Company site (the Site) in Shepherdsville, Bullitt County, Kentucky. The 349-acre Site is located south of Hwy 1526, approximately 4 miles west of U.S. Interstate 65. The purpose of the Five-Year Review is to ensure that the selected cleanup actions effectively protect human health and the environment.

Between 1964 and 1967, 57 acres of the Site were used as a landfill for scrap lumber, fiberglass insulation, and other wastes. Drummed liquid waste was also poured on to the ground at the Site. In 1988, the EPA performed an Emergency Removal Action of contaminated soils near a residence at the Site, and in 1989 the Site was added to EPA's National Priorities List of sites requiring cleanup. Approximately 165 drums were excavated and removed along with 400 gallons of free liquid and 800 cubic yards of contaminated soil. A Record of Decision was signed in 1991, selecting a remedy to address this contamination that included treatment of contaminated ground water, providing potable water to residents affected by ground water contamination, and implementing restrictions on ground water usage. Construction of the remedy was completed in 1996. The remedy also included confirmatory sampling and long-term monitoring, which is ongoing, to ensure the effectiveness of the remedy.

The National Contingency Plan requires that remedial actions that result in any hazardous substances, pollutants, or contaminants remaining at the Site above levels that allow for unlimited use and unrestricted exposure be reviewed every five years to ensure protection of human health and the environment. The third of these Five-Year Reviews for this Site will be completed in April 2008.

EPA invites community participation in the Five-Year Review process.

The EPA is conducting a Five-Year Review to ensure that the site remains protective of human health and the environment. As part of the Five-Year Review process, EPA will be available to answer any questions about the Site. Community members who have questions about the Site, the Five-Year Review process, or who would like to participate in a community interview, are asked to contact the Remedial Project Manager:

Femi Akindele
U.S. EPA, Region 4
61 Forsyth St. (11th Floor)

Atlanta, GA 30303-8936
Phone: 404-562-8809
akindele.femi@epa.gov

EPA plans to complete the Five-Year Review process in about six months; comments are welcome during this time. More information about the site can be found at the Ridgeway Memorial Library at
127 N. Walnut St. Shepherdsville, Kentucky, 40165 or online at:
http://cfpub.epa.gov/supercpad/cursites/csitinfo.cfm?id=0402195

Appendix C: Interview Summary

Five Year Review – 2008
Tri-City Disposal Site, Shepherdsville, Bullitt County, Kentucky
Community Interviews

Community interviews were conducted, by telephone, as part of the Five-Year Review for the Tri-City Disposal Site located in Shepherdsville, Bullitt County, Kentucky. All individuals that were interviewed were notified that the Five-Year Review was being conducted at the Site and that the final report will be placed in the information repository located at the Ridgeway Memorial Library, 127 N. Walnut Street, Shepherdsville, Kentucky 40165, for the public to review.

Most of the citizens that were residing in this area during the cleanup are deceased or are residing in nursing homes. The residents that were interviewed were not pleased during the cleanup or with the results of the cleanup. Several comments and concerns were recorded:

- Do not feel that the Site was cleaned up properly.
- Drums are still partially buried on the property.
- Insulation still exists all around the property.
- Some residents feel that everyone should have been bought out.
- Some residents are requesting that their property be sampled again.
- During the cleanup, one resident had to pay out of pocket to fix his yard because of the damage that was done while excavating a well.
- The Site is a complete eye sore.
- Sampling wells that were installed are not flush to the ground, hard to work around them.
- Steel tanks were placed on a residential property as part of the treatment system, at some point, will someone be coming back to take those up?
- All residents stated that they wish it was cleaned up better.
- One resident has requested a copy of the final report.

Interviews were also conducted with City officials in Shepherdsville, Kentucky. They stated that they have not received any calls, complaints or concerns about the Tri-City Disposal Site.

Community Interviews were conducted by:
Angela R. Miller, Public Affairs Specialist
United States Environmental Protection Agency

Appendix D: Site Inspection Checklist

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST	
I. SITE INFORMATION	
Site name: Tri City Disposal	**Date of inspection: 11/15/07**
Location and Region: Shepherdsville, Kentucky Region 4	**EPA ID: KYD981028350**
Agency, office, or company leading the five-year review: EPA	**Weather/temperature: Cloudy and cold, windy with snow flurries**
Remedy Includes: (Check all that apply) ☒ Landfill cover/containment ☒ Access controls ☒ Institutional controls ☒ Ground water pump and treatment ☐ Surface water collection and treatment ☐ Other _____	☐ Monitored natural attenuation ☐ Ground water containment ☐ Vertical barrier walls
Attachments: ☐ Inspection team roster attached	☐ Site map attached
II. INTERVIEWS (Check all that apply)	
1. **O&M site manager** _____ Name _____ Title mm/dd/yyyy Date Interviewed ☐ at Site ☐ at office ☐ by phone Phone no. _____ Problems, suggestions; ☐ Report attached _____	
2. **O&M staff** _____ Name _____ Title mm/dd/yyyy Date Interviewed ☐ at Site ☐ at office ☐ by phone Phone no. _____ Problems, suggestions; ☐ Report attached _____	

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ mm/dd/yyyy _____
Name Title Date Phone No.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ mm/dd/yyyy _____
Name Title Date Phone No.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ mm/dd/yyyy _____
Name Title Date Phone No.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ mm/dd/yyyy _____
Name Title Date Phone No.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ mm/dd/yyyy _____
Name Title Date Phone No.
Problems; suggestions; ☐ Report attached _____

4. **Other interviews** (optional) ☒ Report attached – see interview forms

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐ O&M manual ☐ Readily available ☐ Up to date ☐ N/A
☐ As-built drawings ☐ Readily available ☐ Up to date ☐ N/A
☐ Maintenance logs ☐ Readily available ☐ Up to date ☐ N/A
Remarks: _____

2. **Site-Specific Health and Safety Plan** ☐ Readily available ☐ Up to date ☐ N/A
☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☐ N/A
Remarks: _____

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☐ N/A
Remarks: _____

4.	**Permits and Service Agreements**				
	☐ Air effluent permit		☐ Readily available	☐ Up to date	☐ N/A
	☐ Effluent effluent		☐ Readily available	☐ Up to date	☐ N/A
	☐ Waste disposal, POTW		☐ Readily available	☐ Up to date	☐ N/A
	☐ Other permits _____		☐ Readily available	☐ Up to date	☐ N/A
	Remarks: _____				
5.	**Gas Generation Records**		☐ Readily available	☐ Up to date	☐ N/A
	Remarks: _____				
6.	**Settlement Monument Records**		☐ Readily available	☐ Up to date	☐ N/A
	Remarks: _____				
7.	**Ground water Monitoring Records**		☐ Readily available	☐ Up to date	☐ N/A
	Remarks: _____				
8.	**Leachate Extraction Records**		☐ Readily available	☐ Up to date	☐ N/A
	Remarks: _____				
9.	**Effluent Compliance Records**				
	☐ Air	☐ Readily available		☐ Up to date	☐ N/A
	☐ Water (effluent)	☐ Readily available		☐ Up to date	☐ N/A
	Remarks: _____				
10.	**Daily Access/Security Logs**		☐ Readily available	☐ Up to date	☐ N/A
	Remarks: _____				
		IV. O&M COSTS			
1.	**O&M Organization**				
	☐ State in-house		☐ Contractor for State		
	☐ PRP in-house		☒ Contractor for PRP		
	☐ Federal Facility in-house		☐ Contractor for Federal Facility		
	☐ Other _____				

2.	**O&M Cost Records** – These were provided after the site inspection, see body of Five-Year Review ☒ Readily available ☐ Up to date ☐ Funding mechanism/agreement in place ☐ Unavailable Original O&M cost estimate _____ ☐ Breakdown attached Total annual cost by year for review period if available From mm/dd/yyyy (Date) To mm/dd/yyyy (Date) _____ (Total cost) ☐ Breakdown attached From mm/dd/yyyy (Date) To mm/dd/yyyy (Date) _____ (Total cost) ☐ Breakdown attached From mm/dd/yyyy (Date) To mm/dd/yyyy (Date) _____ (Total cost) ☐ Breakdown attached From mm/dd/yyyy (Date) To mm/dd/yyyy (Date) _____ (Total cost) ☐ Breakdown attached From mm/dd/yyyy (Date) To mm/dd/yyyy (Date) _____ (Total cost) ☐ Breakdown attached
3.	**Unanticipated or Unusually High O&M Costs During Review Period** Describe costs and reasons: None
	V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A
A. Fencing	
1.	**Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A Remarks: The fencing around the source of the Klapper spring was intact and the gate locked. The fencing around the goat pasture was intact but the gate was not locked.
B. Other Access Restrictions	
1.	**Signs and other security measures** ☐ Location shown on site map ☒ N/A Remarks: _____
C. Institutional Controls (ICs)	

1. **Implementation and enforcement** Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A Type of monitoring (e.g., self-reporting, drive by) _____ Frequency _____ Responsible party/agency _____ Contact _____ (Name) _____ (Title) mm/dd/yyyy (Date) _____ (Phone no.) Reporting is up-to-date ☐ Yes ☐ No ☐ N/A Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☐ N/A Violations have been reported ☐ Yes ☐ No ☐ N/A Other problems or suggestions: ☐ Report attached	
2. **Adequacy** ☐ ICs are adequate ☐ ICs are inadequate ☐ N/A Remarks: ICs are necessary but are not yet in place.	
D. General	
1. **Vandalism/trespassing** ☐ Location shown on site map ☐ No vandalism evident Remarks: Dumping is occurring in the Unnamed Spring No. 1 ravine.	
2. **Land use changes on site** ☐ N/A Remarks: Mr. Cox Senior expressed an interest in constructing another residence on his property. There was also a frame structure for a barn-like building on the Cox property south of the goat pasture.	
3. **Land use changes off site** ☒ N/A Remarks: _____	
VI. GENERAL SITE CONDITIONS	
A. Roads ☒ Applicable ☐ N/A	
1. ☐ Roads damaged ☐ Location shown on site map ☒ Roads adequate ☐ N/A Remarks: There are two gravel roads, one leading from the main road to the Cox Senior residence and one leading from the Cox Senior residence south past the Cox Spring.	
B. Other Site Conditions	
Remarks: In general, the Site has the characteristics of a rural residential area with low-density homes, vegetable gardens, pastureland, and significant surrounding forests.	
VII. LANDFILL COVERS ☒ Applicable ☐ N/A	
A. Landfill Surface	

1.	**Settlement** (Low spots)	☐ Location shown on site map	☐ Settlement not evident
	Arial extent _____		Depth _____
	Remarks: The goat pasture slopes downward as it runs south toward the ravine that becomes the source of Unnamed Spring #1. There are some lower areas as the pasture slopes toward the fence that divides it from the woods and the ravine.		
2.	**Cracks**	☐ Location shown on site map	☒ Cracking not evident
	Lengths _____	Widths _____	Depths _____
	Remarks: _____		
3.	**Erosion**	☐ Location shown on site map	☐ Erosion not evident
	Arial extent _____		Depth _____
	Remarks: The grass in the northern portions of the goat pasture is green and lush. The northern portion of the pasture was not used for waste disposal and is more level. The southern portion of the goat pasture has sparse grass that is not as green. This portion of the goat pasture is still contaminated and shows some signs of erosion due to the fact that it slopes toward the ravine.		
4.	**Holes**	☐ Location shown on site map	☒ Holes not evident
	Arial extent _____		Depth _____
	Remarks: _____		
5.	**Vegetative Cover**	☒ Grass	☒ Cover properly established
	☐ No signs of stress	☐ Trees/Shrubs (indicate size and locations on a diagram)	
	Remarks: The cover for the former waste disposal area is a vegetative cover composed of grass that is now used as pastureland for a small herd of goats.		
6.	**Alternative Cover** (armored rock, concrete, etc.)		☒ N/A
	Remarks: _____		
7.	**Bulges**	☐ Location shown on site map	☒ Bulges not evident
	Arial extent _____		Height _____
	Remarks: _____		
8.	**Wet Areas/Water Damage**	☒ Wet areas/water damage not evident	
	☐ Wet areas	☐ Location shown on site map	Arial extent _____
	☐ Ponding	☐ Location shown on site map	Arial extent _____
	☐ Seeps	☐ Location shown on site map	Arial extent _____
	☐ Soft subgrade	☐ Location shown on site map	Arial extent _____
	Remarks: This area has been very dry lately due to a regional drought.		
9.	**Slope Instability**	☐ Slides	☐ Location shown on site map
	☒ No evidence of slope instability		
	Arial extent _____		
	Remarks: The slope leading down into the ravine that contains the unnamed springs is very steep, but did not seem unstable. The footing was treacherous due to damp clayey soil under fall leaves.		

B. Benches	☐ Applicable ☒ N/A		
	(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	**Flows Bypass Bench** Remarks: _____	☐ Location shown on site map	☐ N/A or okay
2.	**Bench Breached** Remarks: _____	☐ Location shown on site map	☐ N/A or okay
3.	**Bench Overtopped** Remarks: _____	☐ Location shown on site map	☐ N/A or okay
C. Letdown Channels	☐ Applicable ☒ N/A		
	(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		
1.	**Settlement** (Low spots) Arial extent _____ Remarks: _____	☐ Location shown on site map	☐ No evidence of settlement Depth _____
2.	**Material Degradation** Material type_____ Remarks: _____	☐ Location shown on site map	☐ No evidence of degradation Arial extent _____
3.	**Erosion** Arial extent _____ Remarks: _____	☐ Location shown on site map	☐ No evidence of erosion Depth _____
4.	**Undercutting** Arial extent _____ Remarks: _____	☐ Location shown on site map	☐ No evidence of undercutting Depth _____
5.	**Obstructions** ☐ Location shown on site map Size _____ Remarks: _____	Type _____ Arial extent _____	☐ No obstructions
6.	**Excessive Vegetative Growth** ☐ No evidence of excessive growth ☐ Vegetation in channels does not obstruct flow ☐ Location shown on site map Remarks: _____	Type _____ Arial extent _____	
D. Cover Penetrations	☒ Applicable ☐ N/A		

1.	**Gas Vents** ☐ Active ☐ Passive ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A Remarks: _____
2.	**Gas Monitoring Probes** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A Remarks: _____
3.	**Monitoring Wells** (within surface area of landfill) ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks: _____
4.	**Extraction Wells Leachate** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A Remarks: _____
5.	**Settlement Monuments** ☐ Located ☐ Routinely surveyed ☒ N/A Remarks: _____
E. Gas Collection and Treatment ☐ Applicable ☒ N/A	
1.	**Gas Treatment Facilities** ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse ☐ Good condition ☐ Needs Maintenance Remarks: _____
2.	**Gas Collection Wells, Manifolds and Piping** ☐ Good condition ☐ Needs Maintenance Remarks: _____
3.	**Gas Monitoring Facilities** (e.g., gas monitoring of adjacent homes or buildings) ☐ Good condition ☐ Needs Maintenance ☐ N/A Remarks: _____
F. Cover Drainage Layer ☐ Applicable ☒ N/A	
1.	**Outlet Pipes Inspected** ☐ Functioning ☐ N/A Remarks: _____
2.	**Outlet Rock Inspected** ☐ Functioning ☐ N/A Remarks: _____

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A	
1. **Siltation** Area extent _____ Depth _____ ☐ N/A ☐ Siltation not evident Remarks: _____	
2. **Erosion** Area extent _____ Depth _____ ☐ Erosion not evident Remarks: _____	
3. **Outlet Works** ☐ Functioning ☐ N/A Remarks: _____	
4. **Dam** ☐ Functioning ☐ N/A Remarks: _____	
H. Retaining Walls ☐ Applicable ☒ N/A	
1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident Horizontal displacement _____ Vertical displacement _____ Rotational displacement _____ Remarks: _____	
2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident Remarks: _____	
I. Perimeter Ditches/Off-Site Effluent ☐ Applicable ☒ N/A	
1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident Area extent _____ Depth _____ Remarks: _____	
2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A ☐ Vegetation does not impede flow Area extent _____ Type _____ Remarks: _____	
3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident Area extent _____ Depth _____ Remarks: _____	
4. **Effluent Structure** ☐ Functioning ☐ N/A Remarks: _____	
VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A	

1.	**Settlement** ☐ Location shown on site map ☐ Settlement not evident Area extent _____ Depth _____ Remarks: _____
2.	**Performance Monitoring** Type of monitoring _____ ☐ Performance not monitored Frequency _____ ☐ Evidence of breaching Head differential _____ Remarks: _____
IX. GROUND WATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A	
A. Ground water Extraction Wells, Pumps, and Pipelines ☒ Applicable ☐ N/A	
1.	**Pumps, Wellhead Plumbing, and Electrical** ☒ Good condition ☒ All required wells properly operating ☐ Needs Maintenance ☐ N/A Remarks: There are two ground water monitoring wells in operation that are well secured. There are two pump stations at Unnamed Spring #1 and the Cox Spring. These pump systems include piping, a collection drum, and pump system, all of which seemed to be functioning as designed. The collection drums were weathered but intact. The control shed that contained the electrical equipment that runs the pumps was locked and secure. It seemed to be operating as designed.
2.	**Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☒ Good condition ☐ Needs Maintenance Remarks: Only the extraction system at Unnamed Spring #1 is still connected electrically to the control shed, as the Cox Spring's pump system has a float switch installed to replace the electrical line that Mr. Cox cut accidentally. The electronics in the control shed seemed dry and functional.
3.	**Spare Parts and Equipment** ☒ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks: The spare carbon filter drums are stored in the control shed, since they are ordered only once a year and stored on site to be installed as needed.
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A	
1.	**Collection Structures, Pumps, and Electrical** ☐ Good condition ☐ Needs Maintenance Remarks: _____
2.	**Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks: _____
3.	**Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks: _____
C. Treatment System ☒ Applicable ☐ N/A	

1. **Treatment Train** (Check components that apply)

☐ Metals removal ☐ Oil/water separation ☐ Bioremediation

☒ Air stripping ☐ Carbon adsorbers

☒ Filters: Carbon filters

☐ Additive (e.g., chelation agent, flocculent) _____

☐ Others _____

☐ Good condition ☐ Needs Maintenance

☐ Sampling ports properly marked and functional

☐ Sampling/maintenance log displayed and up to date

☐ Equipment properly identified

☐ Quantity of ground water treated annually _____

☐ Quantity of surface water treated annually _____

Remarks: The Cox spring and the Unnamed Spring #1 have water treated with carbon filters, while the Klapper Spring is treated with access controls and natural air stripping.

2. **Electrical Enclosures and Panels** (properly rated and functional)

☐ N/A ☒ Good condition ☐ Needs Maintenance

Remarks: _____

3. **Tanks, Vaults, Storage Vessels**

☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance

Remarks: _____

4. **Effluent Structure and Appurtenances**

☐ N/A ☒ Good condition ☐ Needs Maintenance

Remarks: _____

5. **Treatment Building(s)**

☐ N/A ☒ Good condition (esp. roof and doorways) ☐ Needs repair

☐ Chemicals and equipment properly stored

Remarks: _____

6. **Monitoring Wells** (pump and treatment remedy)

☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition

☒ All required wells located ☐ Needs Maintenance ☐ N/A

Remarks: _____

D. Monitoring Data

1. **Monitoring Data**

☒ Is routinely submitted on time ☒ Is of acceptable quality

2.	**Monitoring data suggests:** ☐ Ground water plume is effectively contained ☐ Contaminant concentrations are declining	
E. Monitored Natural Attenuation		
1.	**Monitoring Wells** (natural attenuation remedy) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☒ N/A Remarks: _____	
X. OTHER REMEDIES		
If there are remedies applied at the Site and not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.		
XI. OVERALL OBSERVATIONS		
A.	**Implementation of the Remedy**	
	Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). The goal of the remedy for OU1 was to 1) treat contaminated ground water, 2) provide safe drinking water to residents, 3) restrict ground water usage until drinking water standards are met, 4) collect confirmatory samples to ensure all media are addressed, 5) perform long-term monitoring of ground water and other affected media. The selected remedy for OU2 was No Action. In terms of addressing the implementation of the selected remedy, the following actions have been taken: 1) treatment of the contaminated ground water is ongoing at the Cox Spring and the Unnamed Spring #1 through the use of carbon filtration. Natural air stripping is treating the ground water at the Klapper spring. 2) the residents were connected to the municipal water mains and therefore have a safe drinking water supply. 3) ground water usage is not restricted through ICs, but rather through an access restriction at the Klapper spring and through verbal agreements with the surrounding residents regarding use of the other springs. 4) the confirmatory sampling was completed in 1992, though KDEP still requests additional soil sampling for the goat pasture and surrounding area to define the extent of remaining contamination. 5) long-term monitoring of the ground water pump and treatment systems is ongoing and samples are collected on a monthly basis. The remedy appears to be functioning as designed. The outstanding issues at the Site include uncertainty about the exact nature and extent of the soil contamination in and around the goat pasture, which may require additional sampling in order to design appropriate ICs for soil. Also, ground water and land use restrictions will need to be formalized with the surrounding property owners. Treatment of the ground water is ongoing because the monitoring has not reflected five years of sampling without an exceedance.	
B.	**Adequacy of O&M**	
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. O&M activities seem to be occurring as planned and in a consistent manner. The pump and treat systems were in good repair and functioning effectively. The access controls around the Klapper spring and the control shed were in place and secure. Reports from the last five years on the ground water monitoring activities were thorough and readily available. These reports indicate progress on addressing the COCs through the current pump and treat remedy.	
C.	**Early Indicators of Potential Remedy Problems**	

	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. There did not seem to be any indicators of potential problems with O&M at the Site. The initial problems with site maintenance and O&M were addressed through measures such as installing a surge protector for the control shed and a float switch for the Cox Spring pump. The systems seem to be functioning properly.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. There do not seem to be any opportunities for optimization of the remedy in terms of the O&M at the Site. Since the pumping, treatment, and monitoring systems have been in place for several years, effective procedures to implement and monitor these systems have been developed and put in place.

Appendix E: Photographs from Site Inspection Visit

View south from inside goat pasture - treatment shed on left and new construction on right

Inside the treatment building – drums of active and spent carbon filters

View north toward Hoosier residences from inside goat pasture

View south toward ravine from inside goat pasture

Flush mounted monitoring well in the goat pasture – MW-2

Monitoring well in Klapper yard – MW-4

Debris and fiberglass insulation dumped in the ravine south of the goat pasture and above Unnamed Spring No. 1

Debris, some of which has weathered out of the ravine, such as the rusted out drums, and some of which, like the tires, has been dumped more recently

Rusted out Dow Corning drum in ravine east of treatment building and south of the goat pasture

Pump station for Unnamed Spring No. 1, at the bottom of the ravine south of the goat pasture

Cox Junior residence and communications infrastructure west of goat pasture

Cox Senior residence west of goat pasture across Klapper Road. Removal occurred in side yard.

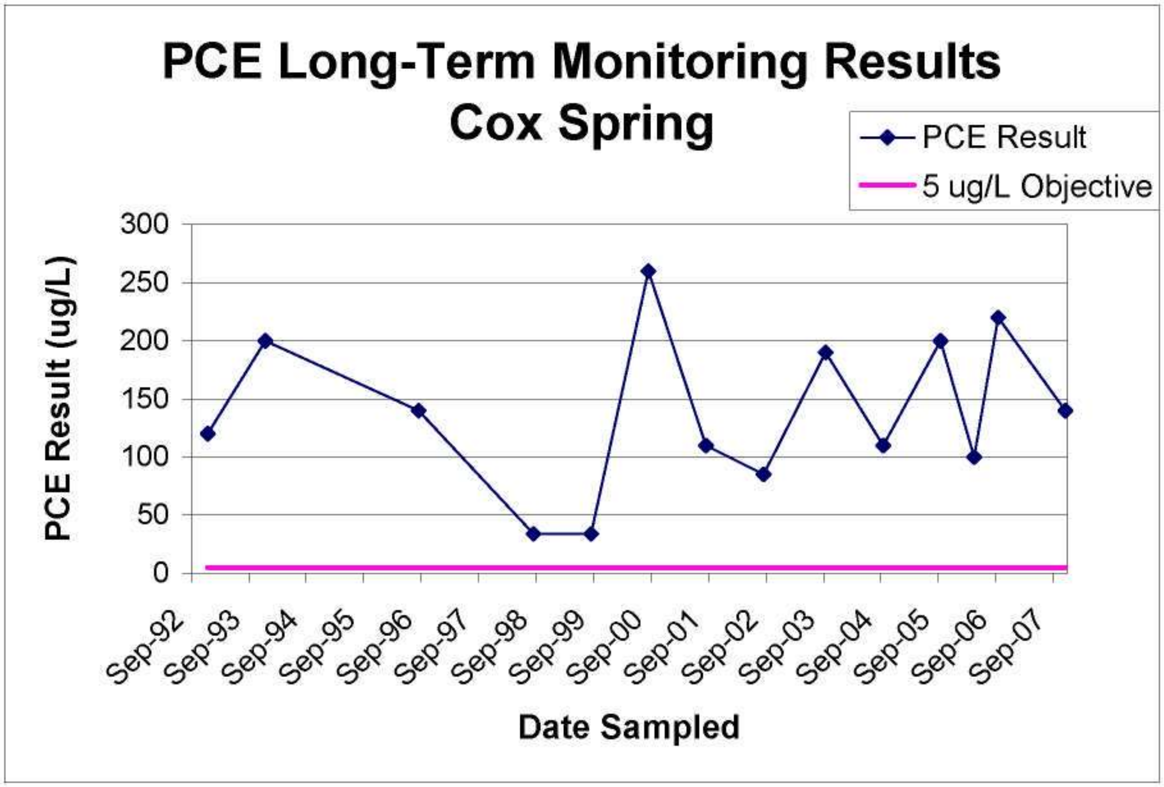

New barn under construction on Cox Sr. property, southeast of Cox Sr. residence

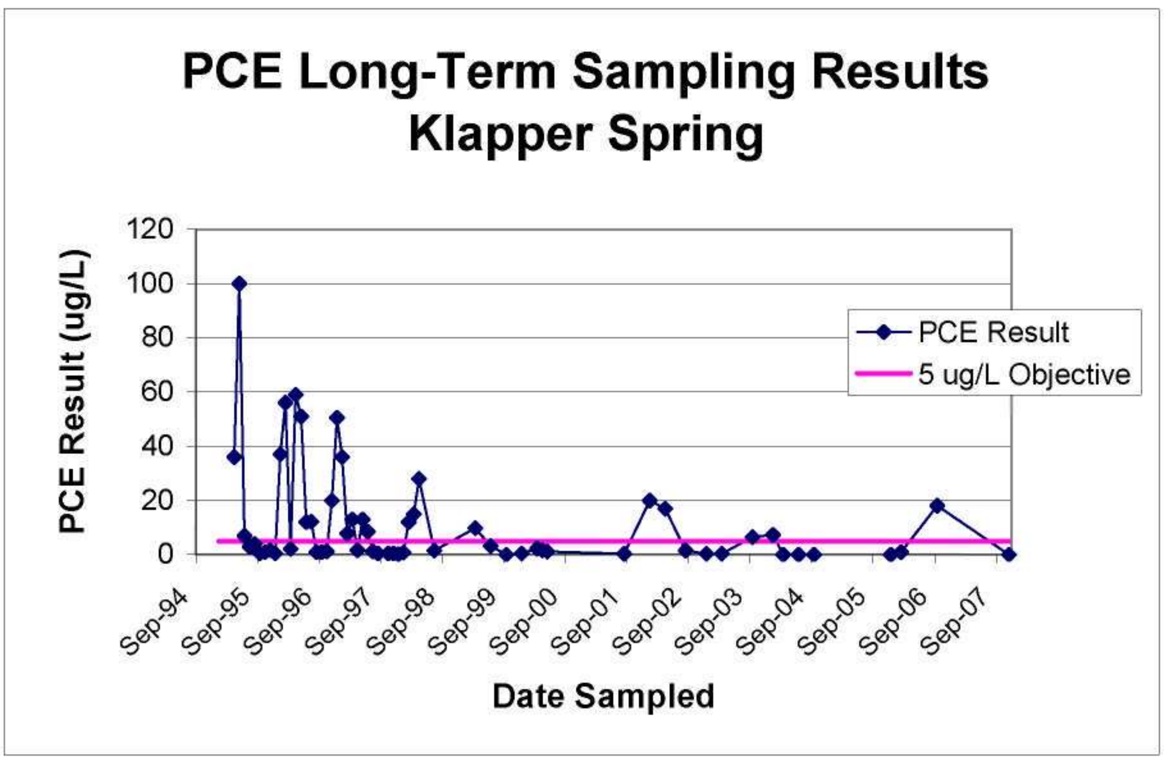

Pump station for Cox Spring

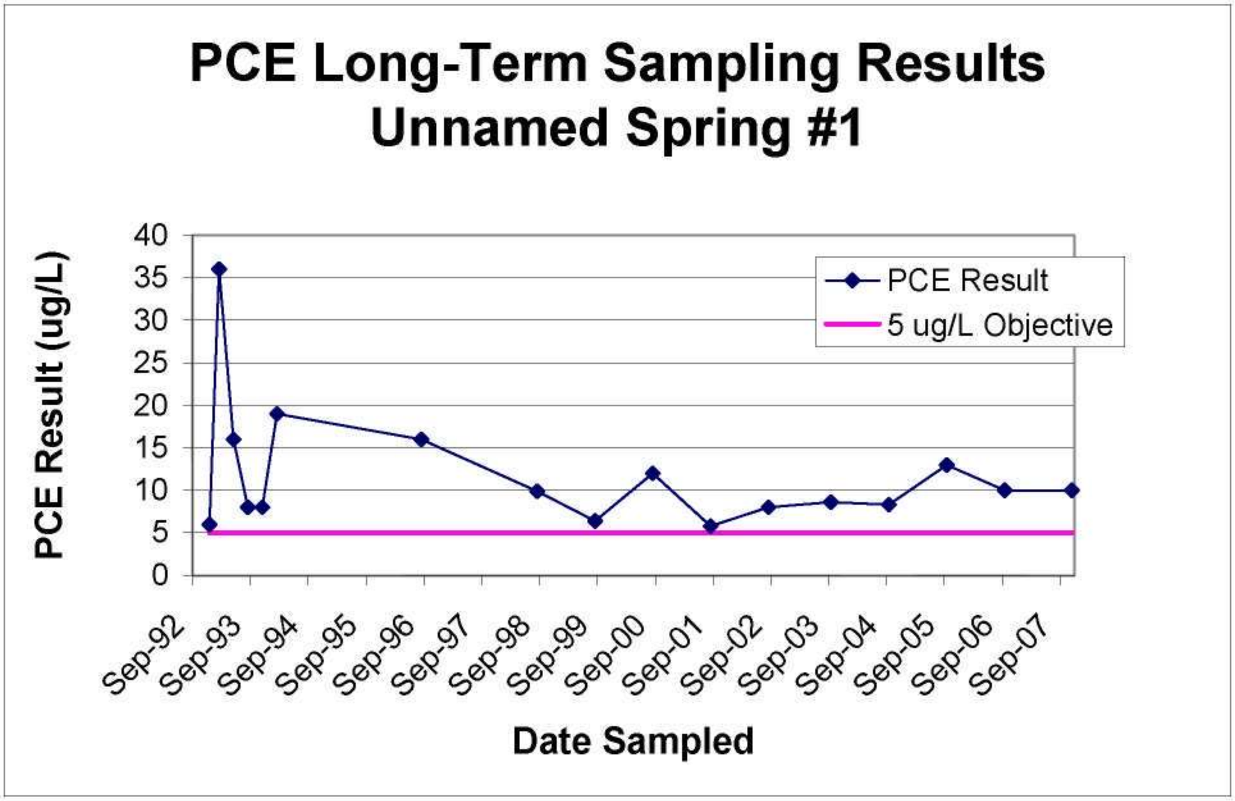

Klapper Senior residence with gardens in foreground

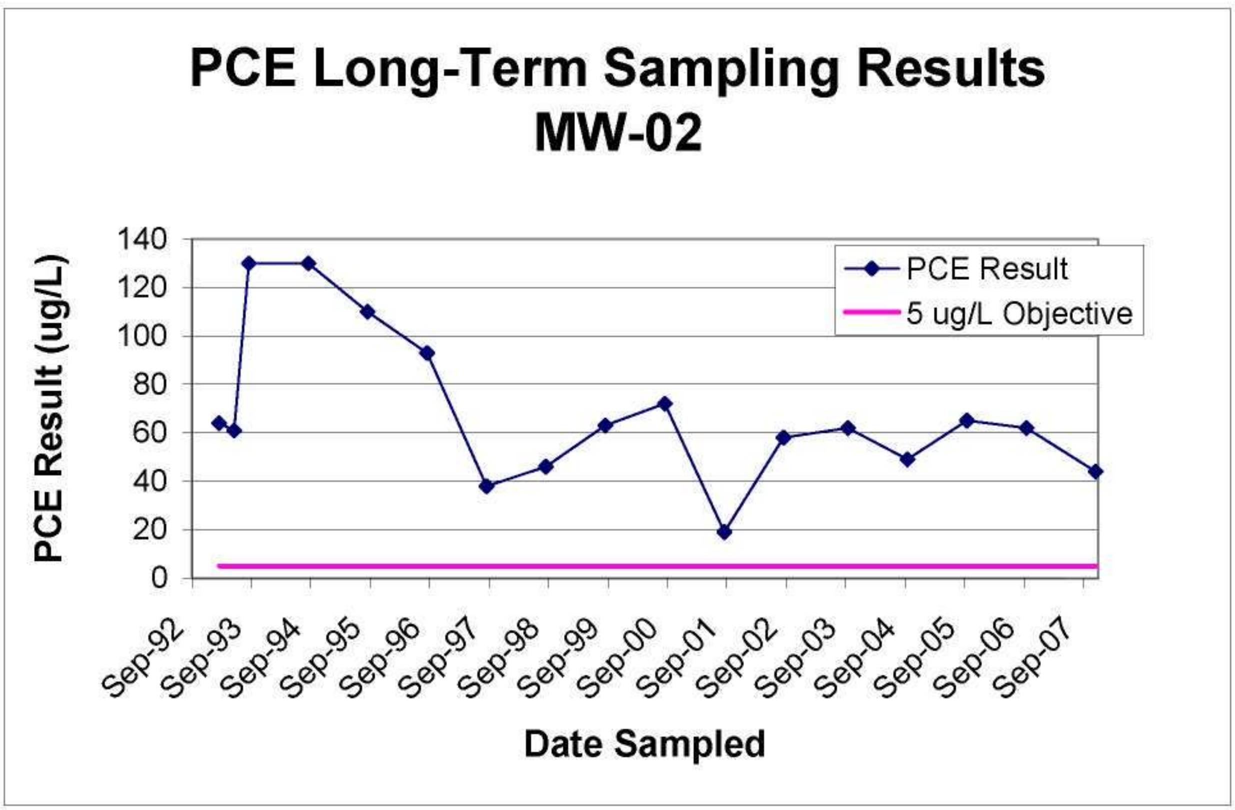

Fenced source of Klapper Spring

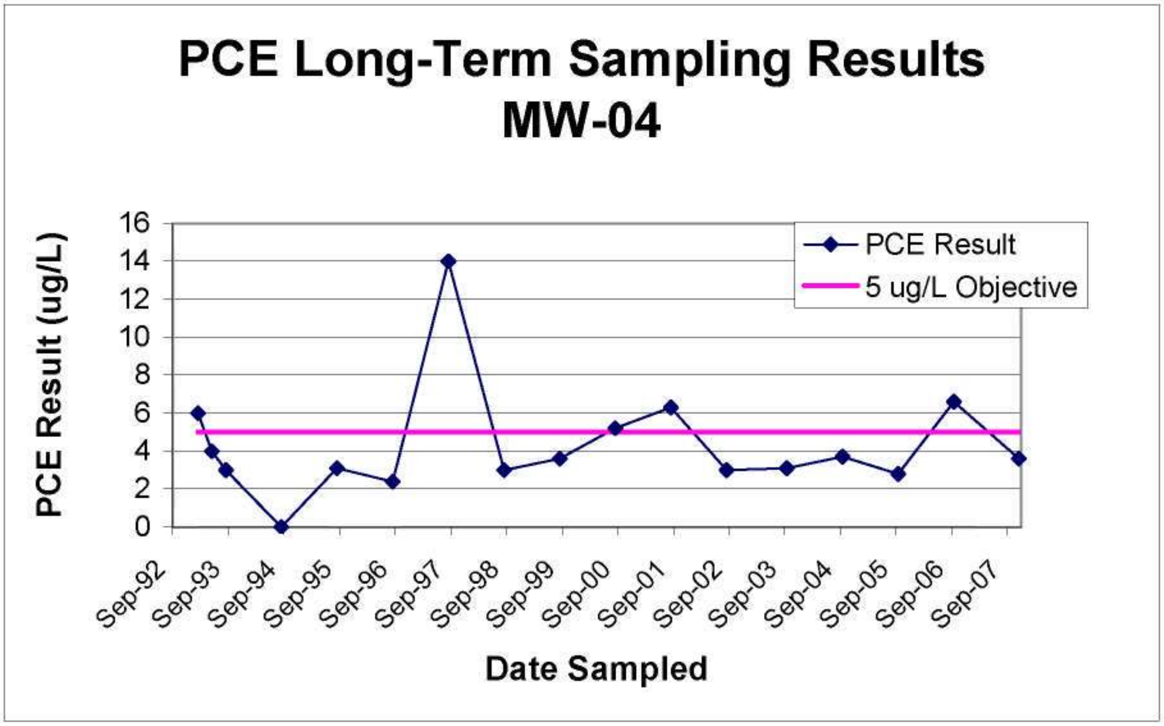
Appendix F: Historical Ground Water Monitoring Results






PCE Long-Term Sampling Results
Unnamed Spring #1
PCE Result (ug/L)
40
35
30
25
20
15
10
5
0
PCE Result
5 ug/L Objective
Sep-92
Sep-93
Sep-94
Sep-95
Sep-96
Sep-97
Sep-98
Sep-99
Sep-00
Sep-01
Sep-02
Sep-03
Sep-04
Sep-05
Sep-06
Sep-07
Date Sampled


PCE Long-Term Sampling Results
MW-02
PCE Result (ug/L)
140
120
100
80
60
40
20
0
PCE Result
5 ug/L Objective
Sep-92
Sep-93
Sep-94
Sep-95
Sep-96
Sep-97
Sep-98
Sep-99
Sep-00
Sep-01
Sep-02
Sep-03
Sep-04
Sep-05
Sep-06
Sep-07
Date Sampled



PCE Long-Term Sampling Results
MW-04
PCE Result (ug/L)
16
14
12
10
8
6
4
2
0
PCE Result
5 ug/L Objective
Sep-92
Sep-93
Sep-94
Sep-95
Sep-96
Sep-97
Sep-98
Sep-99
Sep-00
Sep-01
Sep-02
Sep-03
Sep-04
Sep-05
Sep-06
Sep-07
Date Sampled